



**STATUS SURVEY OF CANE, IDENTIFICATION
OF SPECIES AND HABITAT IN DUARS OF
WEST BENGAL**

**Research Wing, Directorate of Forests
Govt. of West Bengal**

Status survey of cane, identification of species and habitat in Duars of West Bengal

Conducted by

**Divisional Forest Officer, Silviculture (North) Division,
Research Circle, Directorate of Forests,
Government of West Bengal**

And



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প্রধান মুখ্য বনপাল,
গবেষণা, পরিচালনা এবং উন্নয়ন
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Foreword

Rattan (Family: Arecaceae, Subfamily: Calamoideae) is an important forest product as they contribute to the structural complexity, shelter and food. Presently around 48 species and three varieties of rattans are reported to occur in India. In West Bengal three of the five genera of rattan are available. Destruction of their natural habitat has affected their broad genetic base and the population of many useful rattan species have drastically disappeared from various parts of West Bengal.

Contributions in the field of cane distribution, taxonomy, utilisation and propagation are scanty and proportionately very less. There is a need to study in-depth on cane species, which is recognised as one of the important minor forest products, having potential to improve socio-economic condition of forest dwellers and people of adjoining area.

For conserving the present rattan available in West Bengal, a data base was needed to be developed by surveying and identifying their distribution along with their present status in North Bengal.

In view of the above a research project entitled “Status survey of cane, identification of species and habitat in Duars of West Bengal” was Commissioned by the Divisional Forest Officer, Silviculture (North) Division, Research, Monitoring and Development Wing, Directorate of Forest, Govt. of West Bengal, Siliguri - 734001, Darjeeling, West Bengal.

This was assigned to Nature Environment and Wildlife Society (NEWS) who have conducted this survey in association with & technical support of Dr. Sujit Mondal, Research Associate & Prof. Monoranjan Chowdhury, Professor & Head, Taxonomy of Angiosperm & Biosystematics Laboratory, Department of Botany, University of North Bengal, Raja Rammohunpur - 734013, Darjeeling, West Bengal, India.

The survey revealed a total of 8 species of rattans belonging mostly to the two genera *Calamus* (6 sp), and *Daemonorops* (2 sp) along with their diversity in Duars of West Bengal with their detail description and distribution. The study data would be helpful in regeneration of Rattans in North Bengal Forests. However, more research studies are needed in future for nursery techniques and experimental trials in suitable forest areas.

(Vinod Kumar Yadav, IFS)

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1. INTRODUCTION

Rattan (family: *Arecaceae*, subfamily: *Calamoideae*) is an important forest product of South-East Asia as they contribute to the structural complexity, shelter and food (Sunderland 2004). In India, J.D. Hooker (1894) was the first to account for 105 species of rattans from undivided British India. Presently around 46 species and 3 varieties of *rattans* have been recorded from various parts of Himalaya, Western Ghats and Andaman & Nicobar Islands (Basu & Basu 1987; Renuka 1987; Basu 1992; Mondal & Chowdhury 2018; Mondal *et al.* 2019). Recent report of rattans in India denotes, 5 rattan genera comprising about 60 species of which 32 species are endemic (George & Joshi 2012; Mondal *et al.* 2020). In West Bengal three genera (*Calamus*, *Plectocomia* and *Daemonorops*) out of five from India, were recorded (Mondal 2020). Destruction of their natural habitat, the evergreen forests, has affected the board genetic base of rattan. At present a number of rattans is not available in their natural habitat to meet the demands of the rattan industry. So cultivation and conservation of rattan is the immediate need of the hour.

Extensive field surveys were done in entire study area in pre-dominant seasons during March- April 2022. All the rattans species and their population, economic and ethnic uses were recorded in detail and voucher specimens preserved through conventional herbarium techniques (Jain & Rao, 1977). The mounted specimens were taken for critical study and identification initially matched with the pre-identified specimens in NBU-Herbarium and also with character matching with the different Taxonomic literature by various authors (Prain, 1903; Basu 1992, Mondal, Basu & Chowdhury, 2021; Nolte 1994 & IUCN-2014). Some unidentified specimens were taken for matching with herbarium specimens and experts were consulted for different taxa before finalization.

1.1. Taxonomic treatments of *Arecaceae* (*Palmae*)

Bentham and Hooker (1862-1883) placed *Arecaceae* in their classification as follows:

Kingdom: *Plantae*

Subkingdom: *Phanerogamia*

Division: *Angiospermae*

Class: *Monocotyledon*

Series: *Calycinae*

Family: *Arecaceae*

1.2. Authur Cronquist (1981) placed Arecaceae in his classification as follows:

Division: Magnoliophyta

Class: Liliopsida

Subclass: Arecidae

Order: Arecales

Family: Arecaceae

1.3. Takhtajan (1997) placed Arecaceae in his classification as follows:

Division: Magnoliophyta

Class: Liliopsida

Subclass: Arecidae

Series: Arecanae

Family: Arecaceae

1.4. APG III (Chase and Reveal 2009) placed Arecaceae as follows:

Kingdom: Plantae

Clade: Angiosperms

Clade: Angiosperms

Clade: Commelinids

Order: Arecales

Family: Arecaceae

1.5. APG IV (2016) placed Arecaceae as follows:

Kingdom: Plantae

Clade: Angiosperms

Clade: Commelinids

Order: Arecales

Family: Arecaceae

1.6. Major Classifications of Arecaceae (Palmae)

For convenience, classification of family Arecaceae (Palmae) was followed according to (Uhl and Dransfield 1987) viz. subfamilies Coryphoideae, Calamoideae, Nypoideae, Ceroxyloideae, Arecoideae, and Phytelephantoideae. Palms of West Bengal are represented by four subfamilies only viz. Coryphoideae,

Calamoideae, Nypoideae and Arecoideae. The subfamily Coryphoideae is further divided into tribes of Coryphae, Phoeniceae, and Borasseae. The subfamily Calamoideae is divided into tribes of Calameae and Lepidocaryeae. The subfamily Arecoideae is divided into tribes of Caryoteae, Areceae, Cocoeae, Iriarteae and Geonomeae. The tribes of Lepidocaryeae, Iriarteae and Geonomeae are not represented in the Palm flora of West Bengal. The subfamily Nypoideae is a monotypic.

1.7. Dransfield & Uhl (1986) Classification (Subfamilies and tribes)

Subfamily: Coryphoideae: Tribe: Coryphae, Phoeniceae, Borasseae

Subfamily: Calamoideae: Tribe: Calameae, Lepidocaryeae

Subfamily: Nypoideae

Subfamily: Ceroxyloideae: Tribe: Clycospatheae, Ceroxyleae, Hyophorbeae

Subfamily: Arecoideae: Tribe: Caryoteae, Iriarteae, Podococceae, Areceae, Cocoeae, Geonomeae

Subfamily: Phytelephantoideae

1.8. Moore (1973) without rank

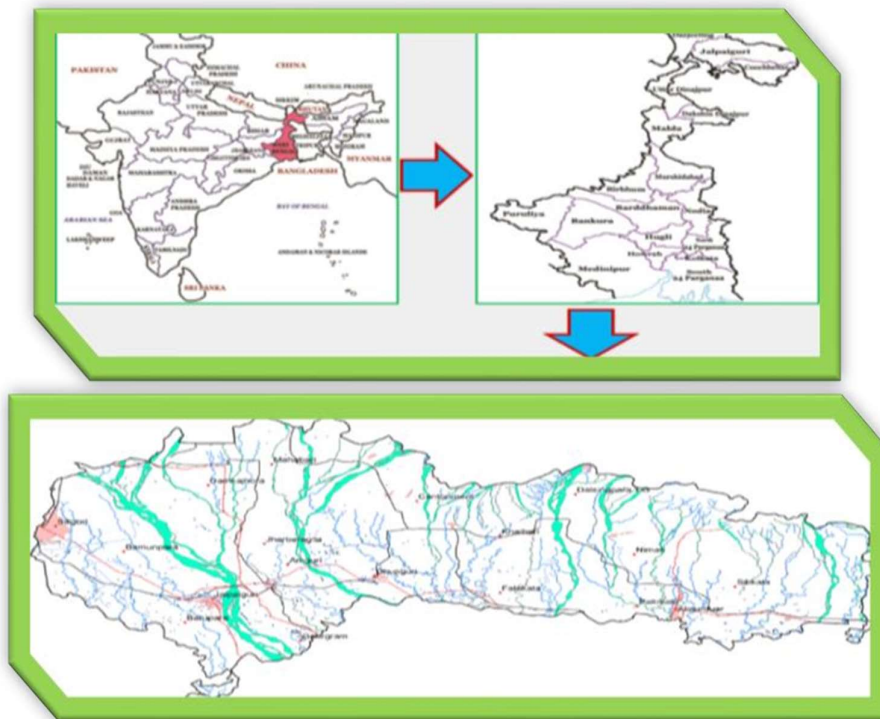
I. Coryphoid palms II. Phoenicoid palms III. Borassoid palms IV. Lepidocaryoid palms V. Nypoid palms VI. Pseudophenicoid palms VII. Ceroxyloid palms VIII. Chamaedoroid palms IX. Caryotoid palms X. Iriarteoid palms XI. Podococcoid palms XII. Arecoid palms XIII. Cocosoid palms XIV. Geonomoid palms XV. Phytelephantoid palms

1.9. Hooker (1883) as tribe

1. Tribe: Areceae Subtribe: Ceroxyleae, Chamaedoreae, Caryotideae, Iriarteae, Wettinieae, Geonomiae and dubia affinitatis
2. Tribe: Phoeniceae
3. Tribe: Coryphea
4. Tribe: Lepidocaryeae
5. Tribe: Borasseae
6. Tribe: Cocoineae

2. STUDY AREA (*Duars region*)

Duars spreads through the districts of Jalpaiguri, Alipurduar and Coochbehar which is the study area for the present project. A belt of moist forests passes along the study areas, at the foot of the majestic Himalayas. The undulating *Terai* and *Duars* (Map: 1) landforms and temporary or permanent virgin elaborate wetland systems form a mosaic of tall grasslands, savannas, evergreen and deciduous forests. The slope of the study area is gentle from north to south and located at 25° 57' to 26° 36' N latitude and 89° 54' to 88° 47' E longitude (Terai) and 26°.16' to 27°.00' N latitude and 88°.04' to 89°.53' E longitude (Duars) with altitudinal range varying from 80 to 100 m above mean sea level. The entire region is made up of sand, gravel and pebbles laid down by major and minor river and/or stream (Khola or Jhora) systems like *Teesta*, *Torsa*, *Jarda*, *Raidak*, *Jaldhaka*, *Sankosh* and several other small rivulets coming from the Darjeeling and Sikkim Himalayas and also from the neighboring countries Nepal and Bhutan. The river Teesta



Map 1: Duars (including Terai) [Source: www.jalpaiguri.gov.in]

has divided this entire area into two parts and the western part is referred as Terai whereas the eastern part is named as *Duars* or *Dooars*. Based on forest types and nature of soil formation the *Duars* region can be further subdivided into the small parts, like Siliguri area as *Western Duars*, the middle or Jalpaiguri part as *Central Duars* and the easternmost end part of Alipurduar is referred as Eastern Duars.

2.1. Weather condition:

The lowest temperature belongs around 26°C and at night it is 14°C in the month of December and January. In January, Duars including Terai gets 6.69 mm of rain and approximately without rainy days in the total month. Humidity belongs close to 53%, where the month of December, shows 3.21 mm of rain and approximately no rainy days. Humidity is close to 63%. The highest temperature around 35°C and at night it feels like 23°C. In April, Buxa gets 129.72 mm of rain and approximately 7 – 10 rainy days in the full month where humidity is close to 51% in the nature.

2.2. Area Visited:

A. Division: Baikunthapur Division

SL. No.	Range	Beat	Compartment	Lat	Long
1	Aambari Range	Lalitabari Beat	3	26°41'16.08"N	88°31'4.51"E
2	Aambari Range	Lalitabari Beat	3	26°41'16.04"N	88°31'4.55"E
3	Aambari Range	Lalitabari Beat	3	26°41'15.02"N	88°31'2.71"E
4	Aambari Range	Lalitabari Beat	9	26°40'55.65"N	88°31'4.84"E
5	Aambari Range	Kundurighi Beat	8	26°40'34.35"N	88°31'43.99"E
6	Apalchand Range	Kathambari Beat	Fuljhora 3	26°45'22.75"N	88°38'23.81"E
7	Apalchand Range	Kathambari Beat	Fuljhora 3	26°45'48.38"N	88°39'23.98"E
8	Targhera Range	Mech Basti Beat	Chel 1	26°47'7.04"N	88°41'43.79"E
9	Targhera Range	Fuljhora Beat	Chel 2	26°47'5.95"N	88°41'46.43"E
10	Dabgram Range	Chutkiavita Beat	Simulguri 7, Bank of Korotoya River	26°41'3.34"N	88°30'18.86"E
11	Sarugara Range	Saraswatipur Beat	Saraswatipur 1, Bank of Teesta River	26°45'50.28"N	88°32'59.24"E
12	Sarugara Range	Saraswatipur Beat	Adabari 10, Bank of Teesta River	26°46'12.47"N	88°32'39.41"E

B. Division: Buxa Tiger Reserve West

SL. No.	Range	Beat	Compartment	Lat	Long
1	Rajabhatkhawa Research Range		SRVK 15	26°37'2.04"N	89°32'28.00"E
2	Rajabhatkhawa Research Range		SRVK 15, Inside Silviculture Nursery	26°37'7.01"N	89°31'55.91"E

C. Division: Coach Behar Forest Division

SL. No.	Range	Beat	Compartment	Lat	Long
1	Coach Behar Range	Atiyamochor Beat		26°25'52.52"N	89°44'13.81"E
2	Coach Behar Range	Nagorhat Beat	Village: Boro Salbari, Dubeipark	26°23'30.37"N	89°42'16.81"E

D. Division: Jaldapara WL Division

SL. No.	Range	Beat	Compartment	Lat	Long
1	Kodal Basti Range		1	26°39'59.51"N	89°21'49.00"E
2	Kodal Basti Range		1	26°40'3.85"N	89°20'54.56"E
3	Madarihat	Uttar Khayerbari		26°39'35.66"N	89°13'55.98"E
4	Madarihat	Uttar Khayerbari		26°39'22.47"N	89°13'41.15"E

E. Division: Jalpaiguri Territorial Forest Division

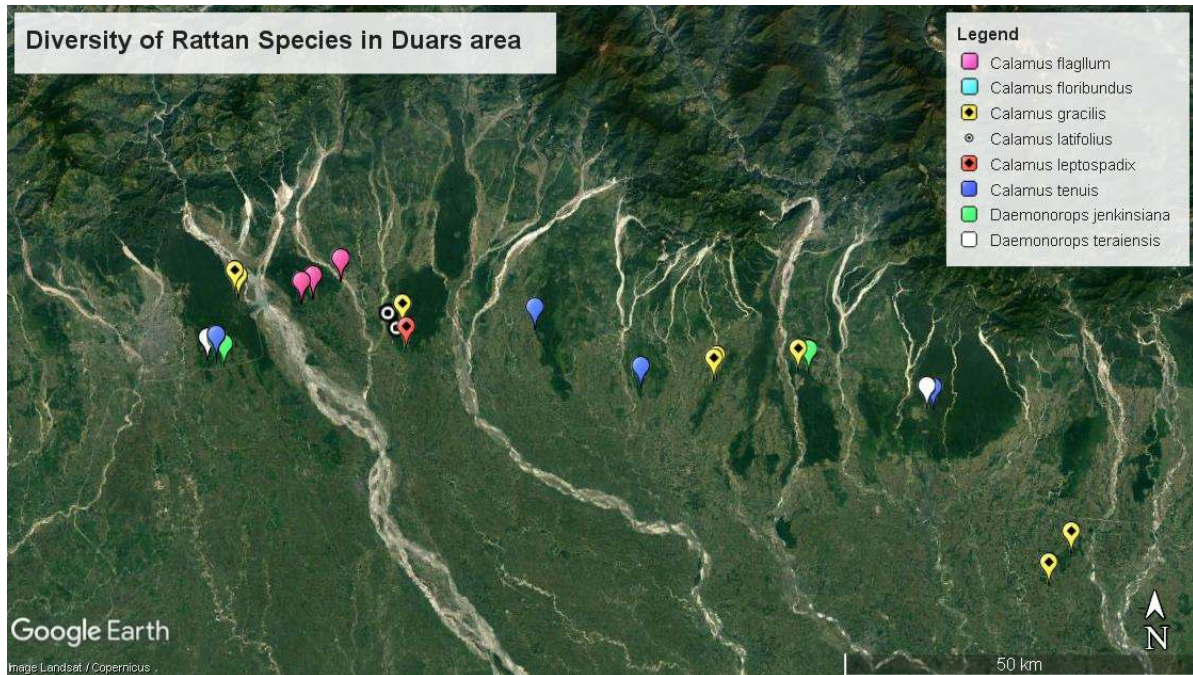
SL. No.	Range	Beat	Compartment	Lat	Long
1	Lataguri Range	Lataguri	Lataguri 2	26°41'53.23"N	88°47'22.57"E
2	Lataguri Range	Lataguri	Lataguri 2	26°41'53.69"N	88°47'20.00"E
3	Lataguri Range	Central Beat	Bichhabhanga 1	26°43'38.83"N	88°47'2.75"E
4	Lataguri Range	Central Beat	Bichhabhanga 1	26°43'36.79"N	88°46'39.45"E
5	Lataguri Range	Borodighi Beat	Sursuti 4	26°44'47.84"N	88°46'1.99"E
6	Lataguri Range	Central Beat	Sursuti 5, Bank of Neora River	26°44'45.53"N	88°45'53.59"E
7	Dalgaon Range	Dalgaon Beat	DLG 1	26°38'48.04"N	89° 7'26.39"E
8	Moraghat Range	Khutimari Beat	CMG 7	26°43'20.34"N	88°58'23.81"E

3. CHARACTERISTICS OF RATTANS

Habit: Rattans are either single stemmed or clump forming. *Leaf:* leaves are large, pinnately compound and spirally arranged on the stem. *Cirrus and flagellum:* The cirrus and flagellum are special climbing organs by which climbing species of canes fix itself on a support. Cirrus is a whip like extension of the leaf rachis and is armed with a series of spines, hooks and claws. All members of *Daemonorops* and *Plectocomia* and some species of *Calamus* of West Bengal are cirrate. A flagellum is the whip like appendage similar to cirrus, but originating from the uppermost part of the leaf sheath. A flagellum is known only in the genus *Calamus* but not all species of *Calamus* are flagellate. *Inflorescence:* Two major types of flowering, hapaxanthic and pleonanthic are distinguishable among the rattans (Dransfield 1979; Basu 1992; Mondal 2020). In hapaxanthic flowering the topmost nodes of rattans produce inflorescences more or less simultaneously and the stem dies after flowering or fruiting whereas in pleonanthic, the stem continues to produce inflorescence, and the stem can continue to grow after flowering. *Fruit:* All true rattans fruits are covered by vertical rows of reflexed overlapping scales. The scales are hard, shiny and frequently grooved vertically along the mid line. Fruit usually one seeded; the outer fleshy layer is called sarcotesta.

4. RESULT AND DISCUSSION

Rattan is one of the most important forest products of the subfamily Calamoideae under tribe Calameae of Arecaceae. The present study revealed a total of 8 species of rattans belonging mostly to the two genera *Calamus* (6 sp), and *Daemonorops* (2 sp). All these species have been enumerated below along with their local names, short description, availability status, flowering and fruiting periods and phytogeography.



Map 2: Diversity of Rattan species in Duars region

5. ENUMERATIONS

Calamus L., Sp. Pl. 1: 325. 1753.

- *Calamus flagellum* Griff., ex Mart., Calc. J. Nat. Hist. 3: 333 1853. “*Pultibet, Rabi bet*”. (Fig:1)

A strong climber; stem cluster forming, with leaf sheath to 4.5 cm in diameter. Leaves ecirrate; leaf sheath with 6 – 7 m long , heavily armed flagellum. Male and female inflorescences are flagelliform, to 5 m or more long; simply decompound, axial part of the inflorescence armed with claws; partial inflorescences about 1 m long, with 3 – 4 rachillae on each side; primary bracts tubular, closely sheathing, lacerate and fibrous on upper part; secondary bracts unarmed, tubular, narrowly funnel shaped , obliquely truncate with triangular appendage on one side; male flowers 8 – 10 mm × 3 mm, curved outside; female rachillae remote , 20 – 25

cm long; female flowers 7 mm long; calyx ovate, 3 dentate; petals lanceolate. Fruits about 3m long, broadly ovoid; fruit scales deeply channeled at middle; seed terete in cross section; embryo basal.

- *Flowering & Fruiting*: June – October.
- *Population Status*: Rare; Endangered (Renuka 2011)
- *Distribution*: Bangladesh, Bhutan, India; Sikkim, Assam, Meghalaya, West Bengal (Darjeeling, Mirik, Alipurduar, Jalpaiguri)
- *Uses*: A large cane similar to *Calamus inermis*, much sought after cane for furniture making.
- *Specimen examined*: West Bengal, Baikunthapur Division, Under Salugara Research Lab; Apalchand Range; Lalitabari Beat, Compartment 3, Apalchand Range Kathambari beat. Compartment: Fuljhora 3, Targhera Range, Mech Basti beat, Compartment: Chel-1. Fuljhora Beat, Compartment Chel-2.



Figure 1: *Calamus flagellum*

- *Calamus floribundus* Griff. Calc. J. Nat. Hist. 5: 56. 1845. (Fig: 2)

A delicate climber; stem 2 m long, cluster forming, with leaf sheath 5 – 6 mm in diameter, green with brown tomentum in colour. Leaves ecirrate, to 40 cm long; ocrea less than 0.5 cm long, densely bristly and hispid outside; leaf sheath armed with scattered, broad based, straight, to 1 cm long spines; flagellum delicate, to 2 m long, thinly armed with small spines; petiole 2-3 cm long; upper part of the petiole and rachis armed below with irregularly arranged claws; leaflets 6-8 in number, in groups, to 20 cm long, about 2 cm broad at middle; terminal leaflets linear-lanceolate, to 15 cm long, connate at base.

Inflorescence to 1.5 m long, flagellate. Male inflorescence slender; flagelliform, simply branched; with 2 partial inflorescences. Ripe fruits globose with distinct columnar beak, 10 mm × 9 mm; fruit scales pale yellow, superficially channeled, arranged in 12 longitudinal series.

- *Flowering & Fruiting:* April – June.
- *Population Status:* Rare; Endangered (Renuka 2011)
- *Distribution:* Bangladesh, Myanmar, India; Assam, Meghalaya, Arunachal Pradesh, Mizoram and Nagaland. West Bengal (Shivkhola, Darjeeling).
- *Uses:* It is used for basket making and other handicrafts, rope *etc.*
- *Specimen examined:* West Bengal, Division Buxa Tiger Reserve West, Under Buxa Rajabhatkhawa Range, Inside Silviculture Nursery.



Figure 2: *Calamus floribundus*

- ***Calamus gracilis*** Roxb., Fl. Ind. ed. 3: 781. 1832. "*Udham bet*". (Fig:3)

A slender climber; stem cluster forming, with leaf sheath 15 – 20 mm in diameter. Leaves ecirrate to 70 cm long; leaf sheath with flagellum armed with long and short needle like spines; longest spines about 3 cm long. Leaflets in group with 2 – 4 leaflets in each opposite groups, deflected in one plane, narrowly oblanceolate, longer leaflets to 50 cm long , 1 cm wide at broadest part; lowermost leaflets 25 cm long, 3 – 5 nerved on upper side; nerves more or less smooth on upper side, bristly on lower side. Male and female inflorescences flagelliform, delicately branched, axial part aculeate, .male flowers distichous, 5 mm × 2 mm; female flowers horizontally projected from rachillae. Fruits broadly ovoid, elliptic, 2.6 m – 3 cm long, 1.4 – 1.7 cm broad.

- *Flowering & Fruiting*: April – November.
- *Population Status*: Rare
- *Distribution*: Africa to Australia; NE India, West Bengal (Terai and Duars)
- *Uses*: Use for furniture.
- *Specimen examined*: West Bengal, Division: Baikanthapur, Under Salugara research Lab. Salugara range, Saraswatipur Beat, Compartment Saraswatipur -1; Division: Coach Behar, Under Coach Behar Range, Beat: Atiyamochor Beat, Nagorhat Beat, Vill: Boro Salbari, Dubeipark.



Figure 3: *Calamus gracilis*

- *Calamus leptospadix* Griff., Calc. Jour. Nat. Hist. 5: 49. 1845. “*Dhangri Bet, Mugri Bet*”. (Fig: 4)

A slender cluster forming climber; stem thickened at joints, with leaf sheath 12 – 20 mm in diameter, naked portion of the stem smooth, 8 – 10 mm in diameter at the internodes. Leaves with our cirrus, delicate looking, 80 – 120 cm long; leaf sheath with flagellum, thickly scurfy outside, armed with flattened, 15 – 20 mm long, subulate, half whorled spines. Male inflorescence shorter, flagelliform, decompound; male rachilla scorpioid, 1-2 cm long, with 6 –12 closely set bifarious flowers. Male flowers 4 – 4.5 × 1.5 mm; calyx tubular, campanulate, divided upto the middle into apiculate lobes; corolla double the length of calyx into 3 oblong segments. Female inflorescence similar to males; female rachillae erect from base. Fruit globose, 1.5 mm in diameter, seed globose; endosperm homogeneous.

- *Flowering & Fruiting*: March – October.
- *Population Status*: Rare; Vulnerable (Renuka 2011)
- *Distribution*: Asia; NE India. West Bengal (Terai & Duars)
- *Uses*: Split canes are strong and durable and used for making chair bottoms.
- *Specimen examined*: West Bengal, Division: Jalpaiguri Territorial, Under Lataguri Research Range. Lataguri Range, Lataguri Beat, Compartment lataguri-2.



Figure 4: *Calamus leptospadix*

- *Calamus tenuis* Roxb., Fl. Ind. 3: 780. 1832. “*Jati bet, sanchi bet*”. (Fig: 5)

A thicket forming slender climber; stem cluster forming, with leaf sheath to 2.5 cm in diameter, without leaf sheath to 15 mm in diameter. Leaves ecirrate about 1 m long; leaf sheath with conspicuous knee, armed with small, broad based spines confluent at their base, developing from transverse crests. Male inflorescence slender, flagelliform, ultra-decompound, rachillae 2 – 3 cm long with two series of 6 – 10 male ; flowers, each 4 mm long. Female inflorescence slender, flagelliform, simply decompound; partial inflorescences to 25 cm long, with 7 – 10 incurved rachillae on each side. Female flowers distinctly 4-seriate cluster. Fruit globose, 10 – 11 mm in diameter, straw coloured, shortly and acutely beaked; fruit scales in 15 longitudinal series, narrowly channeled at middle; 1-seeded, seed globose, deep red to blackish.

- *Flowering & Fruiting*: September – October and April – May.
- *Population Status*: Rare; Least Concern ver 3.1 (IUCN)
- *Distribution*: Asia; NE India; West Bengal (Gangetic plains, Western highlands and plateau)
- *Uses*: Cane is used for making rough baskets and useful raw material for furniture.
- *Specimen examined*: West Bengal, Division: Jalpaiguri Territorial Division, Moraghat Range, Khutimari Beat, Compartment CMG-7; Division: Buxa Tiger Reserve West, Under Buxa Coachbehar Research Range; Rajabhatkhawa Range; Compartment: SRVK-15, Rajabhatkhawa Range, Inside Silviculture Nursery. Division: Jalpaiguri Territorial, Under Lataguri Research Range, Lataguri Range, Lataguri Beat, Compartment: Lataguri-2.



Figure 5: *Calamus tenuis*

- *Calamus latifolius* Roxb. Fl. Ind. 3: 775. 1832. “*Korak Bet*” (Fig:6)

A moderately robust climber; stem cluster forming, with leaf sheath about 3 cm in diameter. Leaves cirrate, 2 – 4 long; leaf sheath prominent knee, armed with subulate, sub regularly verticillate, dark brown, 3 cm long spines. Male inflorescence simply decompounds; partial inflorescence twice branched; rachillae 3 – 4 cm long, with 8 – 12 male flowers on each side of the rachilla. Male flowers 5 mm long, ovoid in bud; calyx externally striated, divided up to the middle to form 3 acute lobes. Female inflorescence simply decompounds, rigid, not very diffused, each 60 – 100 cm long; shorter than leaves; partial inflorescences 4 in number, each 15 – 20 cm long, with 4 – 6 rachillae on each side, Fruit globose, 1 – seeded, dull brown to blackish, to 1.5 cm in diameter; fruit scales flattened, not distinctly channeled at middle; seed globose, blackish, roughly pitted.

- *Flowering & Fruiting*: July – February.
- *Population Status*: Rare
- *Distribution*: Asia; NE India. West Bengal (Darjeeling Himalaya)
- *Uses*: Cane is moderately strong and used for making rough baskets, walking sticks.
- *Specimen examined*: West Bengal, Division: Jalpaiguri Territorial, Under Lataguri Research Range; Lataguri Range; Central Beat; Compartment: Bichhabhanga-1.



Figure 6: *Calamus latifolius*

Daemonorops Blume, Syst. Veg. 7(2): 1333. 1830.

- *Daemonorops jenkinsiana* (Griff.) Mart., Hist. Nat. Palm. 3: 327. 1850. “**Golak Bet, Golla Bet**” (Fig:7)

High climbing rattan: stem with leaf sheath 3-4 cm in diameter; internodes 15 -20 cm long, longitudinally striate. Leaves cirrate; leaf blade excluding cirrus to 3 m long. Inflorescence sub-axillary or inserted above the mouth of their sheaths. Male flowers oblong in bud, 5 × 2.5 mm; calyx copular, hairy at tips; corolla with 3 ob-lanceolate petals; stamens 6, anthers subulate, connate and thickened at base. Rachillae in female inflorescence upto 8 cm long, sinuous; female flowers 6 – 7 in number on each side; each 5 – 5.5 mm long; calyx copular, truncate; corolla distinctly veined, with deeply divided lanceolate petals; ovary ovoid to globose. Fruit globose, 1.8 cm in diameter, minutely pitted; pits filled with dark sub resinous substances; endosperm ruminant.

- *Flowering & Fruiting*: July – May.
- *Population Status*: Common; Near Threatened (Renuka 2011)
- *Distribution*: Asia; India; West Bengal; Darjeeling Himalaya, Terai and Duars (North Rajabhatkhawa)
- *Uses*: The leaves of *Daemonorops jenkinsiana* are used for thatching and fruits are favourite food of wild elephants.
- *Specimen examined*: West Bengal, Division: Baikunthapur Division, Under Salugara Research Lab; Aambari Range; Beat: Lalitabari Beat; Compartment: 3 & 9. Beat: Kundurdighi beat; Compartment: 8.



Figure 7: *Daemonorops jenkinsiana*

- *Daemonorops teraiensis* Mondal and Chowdhury "**Kanra bet (Nepali)**". (Fig:8)

Climbing rattan, 6–8 m tall; stem erect, covered with sheath, 8–12cm in diameter, internodes 10–12cm; without sheath up to 10.4 cm in diameter. Leaves cirrate; leaf excluding cirrus 1.85–2.43m long; leaflets 72–80 on each side of rachis; equidistant, alternate to sub opposite, 18–24 × 48–52 cm long, apical leaflets 0.6–1 × 1.8–2.2 cm, 3 nerved. Inflorescence sub-axillary not very broadly fusiform; male flowers oblong in bud, 2×5 mm; calyx copular, petals 3–4 mm × 1–2 mm; stamens 6; 2–3 mm long; female flowers 2–3 in number on each side; 4–5 mm long; calyx copular, 2–3 mm long, ovary ovoid to globose, stigmas 3, Fruit globose, 1.8 cm in diameter.

- *Flowering & Fruiting*: March – June
- *Population Status*: Endangered (Mondal et al. 2019)
- *Distribution*: India; West Bengal, Sikkim, Assam, Meghalaya; Bangladesh, Bhutan.
- *Specimen examined*: Division: Baikunthapur Division, Under Salugara Research Lab. Aambari Range; Lalitabari Beat; Compartment: 3.



Figure 8: *Daemonorops teraiensis*

6. CONSERVATION

Rattan conservation does not advocate a total stoppage of rattans collection and utilization because this will deprive rural artisans and craftsmen from earning their livelihood and the furniture industries will suffer causing unemployment and resentment. For conserving the rattan resource bases some serious action is needed so that productive clumps are maintained within their capacity to revive. As most of the indigenous canes are clump forming so, the only climbers that have required to provide support to the newly growing shoots and at the same time maintenance of the canopy. Silviculture Division of research wing of Forest directorate under Govt. of West Bengal have already enforced various acts and rules against destruction of rattan and have focused on the planting of seeds and seedling of rattan species back to wild.

6.1. *In – situ* Conservation

In-situ conservation or the onsite conservation are being carried out to protect rattan diversity in their natural populations. The protected area network in this includes National Parks, Wildlife Sanctuaries, Biosphere Reserve (terrestrial or marine) etc. This type of conservation helps to protect endangered plants including rattans and animal species in their own natural habitat.

6.2. *Ex – situ* Conservation

The term ex-situ as used in this action plan refers to Botanic Gardens, arboreta and similar institutions containing scientifically ordered and maintained collection of live plants and their population through cultivation and usually documented and labelled. These areas are also remaining open to public for the purpose of recreation, education and research purposes.

7. CONCLUSION

Rattans are naturally found in the various forests of North Bengal located between 25°50' and 27°12' N latitudes and 88°71' and 89°53' E longitudes, receiving high rainfall varying between 2000 mm and 6250 mm.

As per the previous studies, among 5 Indian rattan genera, three (*Calamus*, *Daemonorops* and *Plectocomia*) were recorded in West Bengal (hills, foothills and plains) with a total of 18 species of rattans. In this present study focusing especially in Duars region, two (*Calamus* and *Daemonorops*) out of three genera are recorded from the boundary line of Duars of Sub Himalayan forest of West Bengal, India. A total 8 number of species of rattan were listed from various parts of Duars of North Bengal, where *Calamus floribundas*, *Calamus gracilis*, have natural distribution. *Daemonorops jenkinsiana* locally called “Duhia/Dragon bet” is found in the Mixed Plain Forests (wet) of Rajabhatkhawa Range and Ambari range office areas. The stems of *Daemonorops* are much long, stout, scandent and are used for making baskets and various type handicrafts. *Calamus tenuis*, locally known as “Pani bet”, is a long climber cane found mainly in marshy places of Terai tract of *Shorea robusta* Forests. *Calamus latifolius* and *Daemonorops teraiensis* are important rattans, and have single bushes recorded from Ambari range and Lataguri Range of Jalpaiguri District. The present study shows the clear diversity of indigenous rattans in Duars of West Bengal along with their details description, uses, distribution and conservation pattern.

Comment: Most of the rattan diversity is concentrated in the hill regions of West Bengal, so for the extensive conservation strategy the survey of rattans in hill region should be incorporated in near future for the overall understanding of the diversity and conservation methods.

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ANNEXURE
Species found under various Forest Divisions with total area
A. Division: Baikunthapur Division

SL. No.	Range	Beat	Compartment	Lat	Long	Species	Area (Sq Mt)	Bush numbers in 20/20 mtr
1	Aambari Range	Lalitabari Beat	3	26°41'16.08"N	88°31'4.51"E	<i>Calamus tenuis</i>	308	3
2	Aambari Range	Lalitabari Beat	3	26°41'16.04"N	88°31'4.55"E	<i>Daemonorops teraiensis</i>		2
3	Aambari Range	Lalitabari Beat	3	26°41'15.02"N	88°31'2.71"E	<i>Daemonorops jenkinsiana</i>	124	1
4	Aambari Range	Lalitabari Beat	9	26°40'55.65"N	88°31'4.84"E	<i>Daemonorops jenkinsiana</i>	1380	1
5	Aambari Range	Kunduridighi Beat	8	26°40'34.35"N	88°31'43.99"E	<i>Daemonorops jenkinsiana</i>	848	1
6	Apalchand Range	Kathambari Beat	Fuljhora 3	26°45'22.75"N	88°38'23.81"E	<i>Calamus flagellum</i>	1018	1
7	Apalchand Range	Kathambari Beat	Fuljhora 3	26°45'48.38"N	88°39'23.98"E	<i>Calamus flagellum</i>	2908	1
8	Targhera Range	Mech Basti Beat	Chel 1	26°47'7.04"N	88°41'43.79"E	<i>Calamus flagellum</i>	12960	3
9	Targhera Range	Fuljhora Beat	Chel 2	26°47'5.95"N	88°41'46.43"E	<i>Calamus flagellum</i>	6345	4
10	Dabgram Range	Chutkiavita Beat	Simulguri 7, Bank of Korotoya River	26°41'3.34"N	88°30'18.86"E	<i>Daemonorops teraiensis</i>	3032	1
11	Sarugara Range	Saraswatipur Beat	Saraswatipur 1, Bank of Teesta River	26°45'50.28"N	88°32'59.24"E	<i>Daemonorops teraiensis and Calamus gracilis</i>	335 + 694	2
12	Sarugara Range	Saraswatipur Beat	Adabari 10, Bank of Teesta River	26°46'12.47"N	88°32'39.41"E	<i>Calamus gracilis</i>	1222	1

B. Division: Buxa Tiger Reserve West

SL. No.	Range	Beat	Compartment	Lat	Long	Species	Area	Bush numbers in 20/20 mtr
1	Rajabhatkhawa Research Range		SRVK 15	26°37'2.04"N	89°32'28.00"E	<i>Calamus tenuis</i> saplings	1119	-
2	Rajabhatkhawa Research Range		SRVK 15, Inside Silviculture Nursery	26°37'7.01"N	89°31'55.91"E	<i>Calamus floribundus</i> and <i>Daemonorops teraiensis</i>	523	1

C. Division: Coach Behar

SL. No.	Range	Beat	Compartment	Lat	Long	Species	Area	Bush numbers in 20/20 mtr
1	Coach Behar Range	Atiyamochor Beat		26°25'52.52"N	89°44'13.81"E	<i>Calamus gracilis</i>	1292	2
2	Coach Behar Range	Nagorhat Beat	Village: Boro Salbari, Dubeipark	26°23'30.37"N	89°42'16.81"E	<i>Calamus gracilis</i>	15772	3

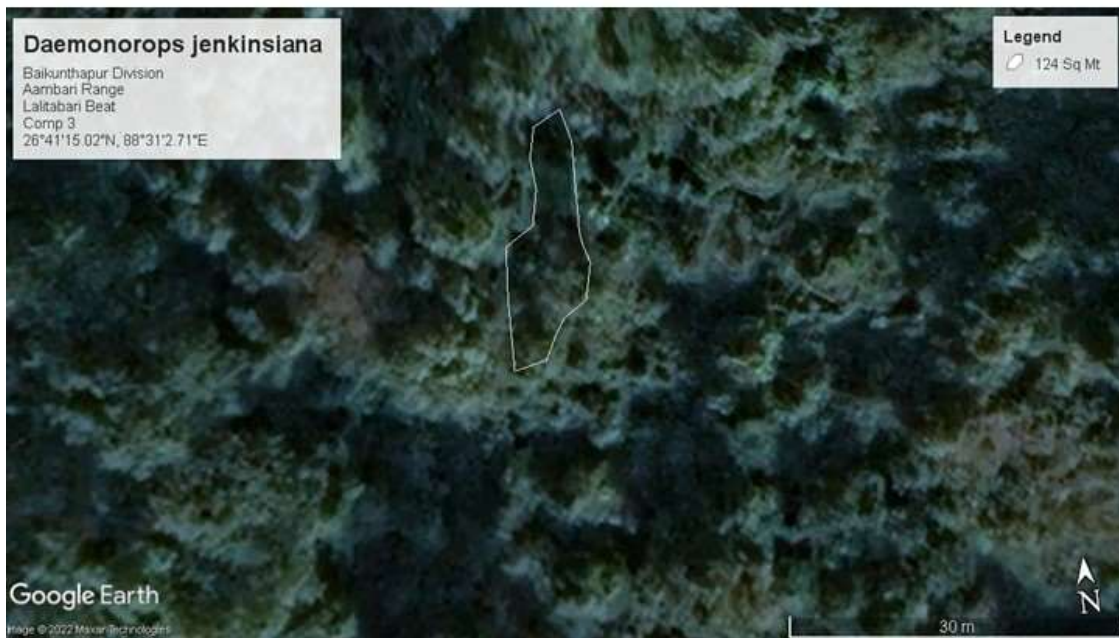
D. Division: Jaldapara WL, Under Buxa-Coachbehar Research Range

SL. No.	Range	Beat	Compartment	Lat	Long	Species	Area	Bush numbers in 20/20 mtr
1	Kodal Basti Range		1	26°39'59.51"N	89°21'49.00"E	<i>Daemonorops jenkinsiana</i>	251	2
2	Kodal Basti Range		1	26°40'3.85"N	89°20'54.56"E	<i>Calamus gracilis</i>	709	2
3	Madarihat	Uttar Khayerbari		26°39'35.66"N	89°13'55.98"E	<i>Calamus gracilis</i>	172	1
4	Madarihat	Uttar Khayerbari		26°39'22.47"N	89°13'41.15"E	<i>Calamus gracilis</i>	1192	1

E. Division: Jalpaiguri Territorial

SL. No.	Range	Beat	Compartment	Lat	Long	Species	Area	Bush numbers in 20/20 mtr
1	Lataguri Range	Lataguri	Lataguri 2	26°41'53.23"N	88°47'22.57"E	<i>Calamus leptospadix</i>	78.8	1
2	Lataguri Range	Lataguri	Lataguri 2	26°41'53.69"N	88°47'20.00"E	<i>Calamus gracilis</i>	221	2
3	Lataguri Range	Central Beat	Bichhabhanga 1	26°43'38.83"N	88°47'2.75"E	<i>Calamus gracilis</i>	231	1
4	Lataguri Range	Central Beat	Bichhabhanga 1	26°43'36.79"N	88°46'39.45"E	<i>Calamus latifolius</i>	87	1
5	Lataguri Range	Borodighi Beat	Sursuti 4	26°44'47.84"N	88°46'1.99"E	<i>Calamus latifolius</i>	40.2	1
6	Lataguri Range	Central Beat	Sursuti 5, Bank of Neora River	26°44'45.53"N	88°45'53.59"E	<i>Calamus latifolius</i>	7602	2
7	Dalgaon Range	Dalgaon Beat	DLG 1	26°38'48.04"N	89°7'26.39"E	<i>Calamus tenuis</i>	165846	1
8	Moraghat Range	Khutimari Beat	CMG 7	26°43'20.34"N	88°58'23.81"E	<i>Calamus tenuis</i>	3111	2

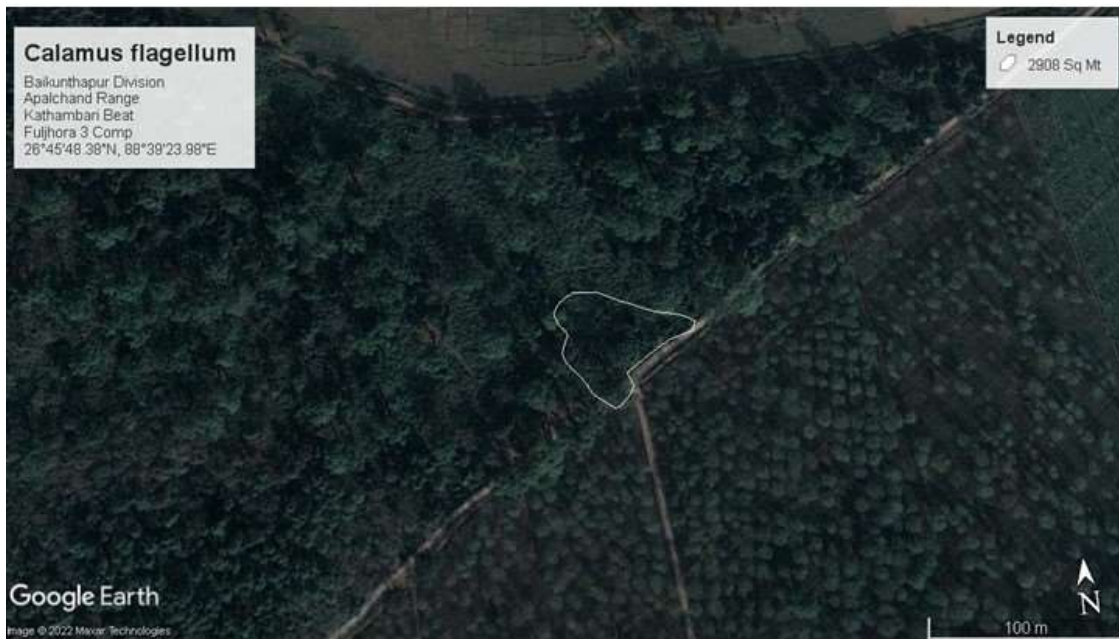
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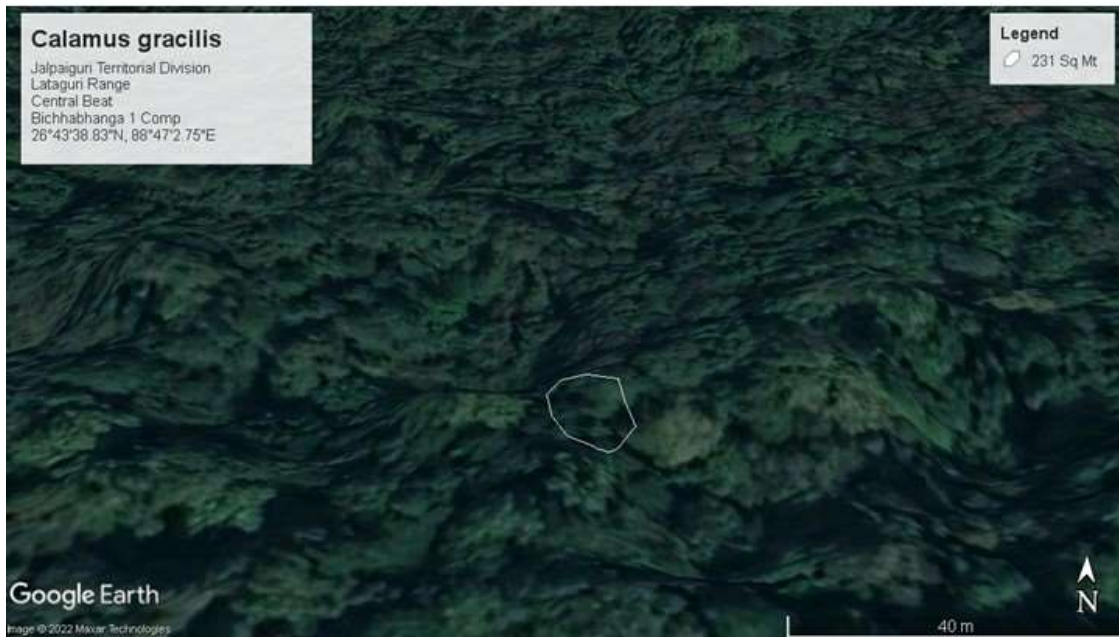








Jalpaiguri Territorial Forest Division







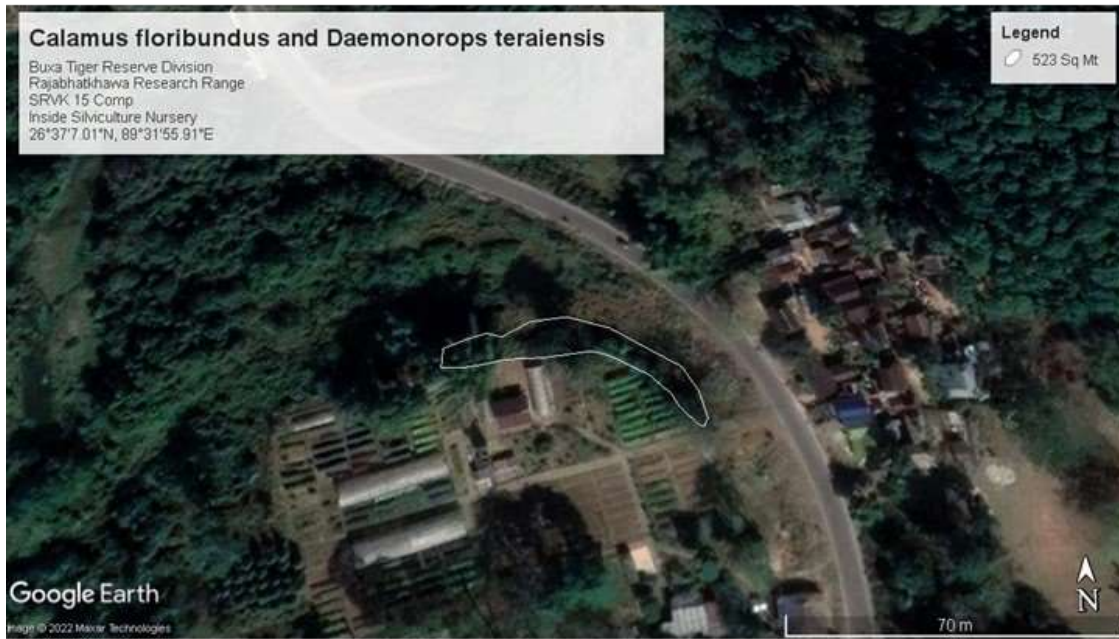


Jaldapara Wildlife Forest Division





Buxa Tiger Reserve West Division



Coach Behar Forest Division



Cane habitat, fruits and flowers of various places of Duars

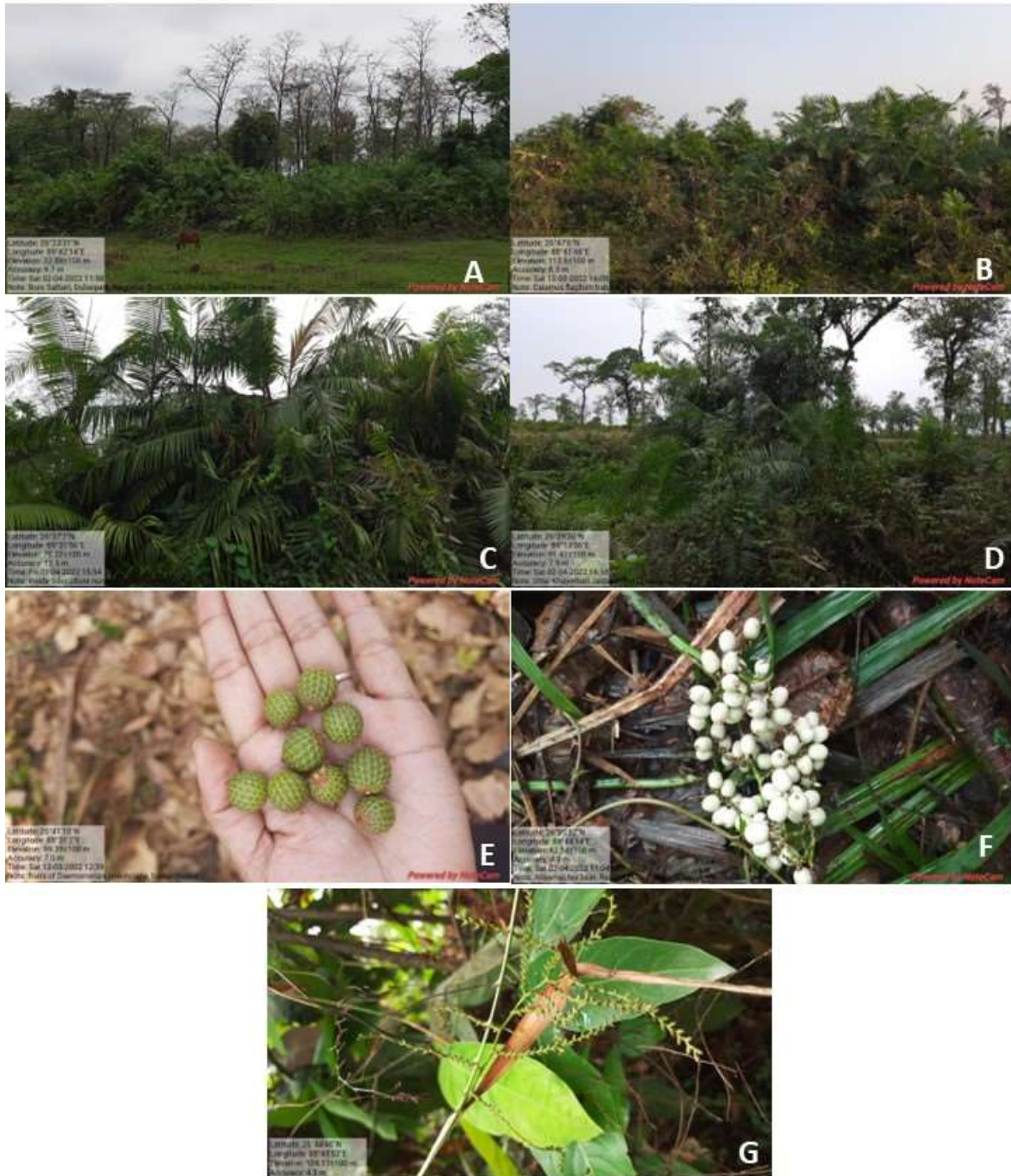


Figure A: Cane Habitat at Boro Salbari, Coachbehar Range; **Figure B:** Cane Habitat at Chel 2, Targhera Range; **Figure C:** Cane Habitat inside Silviculture Nursery, Rajabhatkhowa; **Figure D:** Cane habitat at Uttar Khayerbari, Madarihat Range; **Figure E:** Fruits of *Daemonorops jenkinsiana*; **Figure F:** Fruits of *Calamus gracilis*; **Figure G:** Flower of *Calamus latifolius*

Researchers collecting samples from different regions

