

**Project Title:**

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Assessing the diversity of national red listed vascular plants and hotspots identification at Rema-Kalenga Wildlife Sanctuary, Bangladesh

**Project leader:**

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**Project summary**

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Rema-Kalenga Wildlife Sanctuary (RKWS) is one of the most critical protected areas (PA) in Bangladesh where a large number endemic plant and animal species have already disappeared due to severe anthropogenic disturbances. Therefore, assessment of red listed species diversity and identification of biodiversity hotspots are important in conservation management. Hence, the general objective of the work is to develop baseline information on the occurrence and diversity patterns of the national red listed vascular plant species in the PA to foster conservation of these threatened components of nature.

**Specific objectives**

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- (I) Quantification of red listed species diversity and exploration of their distributional patterns in different habitats.
- (II) Identification of hotspots within the PA.

**Results**

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***Diversity of Red Listed Vascular Plants***

We found a total of 66 red listed vascular plants of 35 families and 55 genera in the Rema-Kalenga Wildlife Sanctuary (Table 1). Plantation forest consists of 47 species of 42 genus and 28 families. Natural forest has 17 unique species. Highest richness value (18) was found in plot 2 of natural forest and lowest value was observed in sample plot 4 (Figure 1a). Out of 50 plots in

plantation forest 4 plots did not have any red listed species. Richness value ranged from 0 to 14 with a mean value of 5.32. In terms of alpha diversity, mean values were 1.64 and 1.07 for natural and plantation forests, respectively (Figure 1b). Natural forest had the highest alpha diversity value (2.64) compared to the value of plantation forest, which makes up 2.43 only.

**Table 1.** Red listed vascular plants in Rema-Kalenga Wildlife Sanctuary

| Family           | Genus               | Scientific Name                | Life form |
|------------------|---------------------|--------------------------------|-----------|
| Acanthoaceae     | Justica             | <i>Adhatoda zeylanica</i>      | S         |
| Anacardiaceae    | Mangifera           | <i>Mangifera longipes</i>      | V         |
|                  | Mangifera           | <i>Mangifera sylvatica</i>     | V         |
|                  | <i>Semicarpus</i>   | <i>Semicarpus anacardium</i>   | T         |
|                  | Spondias            | <i>Spondias pinnata</i>        | T         |
| Apocynaceae      | Alstonia            | <i>Alstonia scholaris</i>      | T         |
|                  | <i>Holigrana</i>    | <i>Holigrana longifolia</i>    | T         |
|                  | <i>Willoughbeia</i> | <i>Willoughbeia edulis</i>     | V         |
| Araceae          | <i>Aglaonema</i>    | <i>Aglaonema hookerianum</i>   | H         |
|                  | <i>Homalomena</i>   | <i>Homalomena aromatica</i>    | H         |
|                  | <i>Stuednera</i>    | <i>Stuednera colocasioides</i> | H         |
| Arecaceae        | Calamus             | <i>Calamus tenuis</i>          | C         |
|                  | Daemonorops         | <i>Daemonorops jenkinsiana</i> | C         |
|                  | Didymosperma        | <i>Didymosperma nana</i>       | C         |
|                  | Liculata            | <i>Liculala peltata</i>        | Palm      |
| Bignoniaceae     | Oroxylum            | <i>Oroxylum indicum</i>        | T         |
|                  | <i>Bombax</i>       | <i>Bombax insigne</i>          | T         |
| Caesalpinaceae   | <i>Cassia</i>       | <i>Cassia fistula</i>          | T         |
|                  | <i>Cassia</i>       | <i>Cassia nodosa</i>           | T         |
| Clusiaceae       | Garcinia            | <i>Garcinia xanthochymus</i>   | T         |
| Combretaceae     | <i>Terminalia</i>   | <i>Terminalia bellirica</i>    | T         |
|                  | <i>Terminalia</i>   | <i>Terminalia citrina</i>      | T         |
| Dilleniaceae     | Dillenia            | <i>Dillenia indica</i>         | T         |
| Dioscoreaceae    | <i>Dioscorea</i>    | <i>Dioscorea prazeri</i>       | V         |
| Dipterocarpaceae | <i>Shorea</i>       | <i>Shorea robusta</i>          | T         |
| Elaeocarpaceae   | Elaeocarpus         | <i>Elaeocarpus robustus</i>    | T         |
| Euphorbiaceae    | Antidesma           | <i>Antidesma ghaesembila</i>   | S         |
|                  | Baccaurea           | <i>Baccaurea ramiflora</i>     | T         |
|                  | <i>Macaranga</i>    | <i>Macaranga denticulata</i>   | T         |
|                  | <i>Macaranga</i>    | <i>Macaranga indica</i>        | S         |
|                  | <i>Macaranga</i>    | <i>Macaranga peltata</i>       | T         |
|                  | <i>Phyllanthus</i>  | <i>Phyllanthus embelica</i>    | T         |
| Fagaceae         | <i>Castanopsis</i>  | <i>Castanopsis indica</i>      | T         |
| Fabaceae         | <i>spatholobus</i>  | <i>Butea roxburghii</i>        | V         |
| Guttiferae       | Garcinia            | <i>Garcinia cowa</i>           | T         |
| Lauraceae        | <i>Litsea</i>       | <i>Litsea glutinosa</i>        | T         |
| Lecythidaceae    | Careya              | <i>Careya arborea</i>          | T         |
| Leguminosae      | Albizia             | <i>Albizia lebbek</i>          | T         |
|                  | Albizia             | <i>Albizia lucida</i>          | T         |
|                  | <i>Entada</i>       | <i>Entada phaseoloides</i>     | V         |

|                |                      |                                 |   |
|----------------|----------------------|---------------------------------|---|
| Liliaceae      | Crinum               | <i>Crinum defixum</i>           | H |
| Meliaceae      | <i>Chukrasia</i>     | <i>Chukrasia tabularis</i>      | T |
| Menispermaceae | <i>Pericampyllus</i> | <i>Pericampyllus glaucus</i>    | V |
|                | <i>Tinospora</i>     | <i>Tinospora crispa</i>         | V |
| Moraceae       | <i>Fiscus</i>        | <i>Fiscus glomerata</i>         | S |
|                | <i>Fiscus</i>        | <i>Fiscus recemosa</i>          | T |
|                | <i>Fiscus</i>        | <i>Fiscus religiosa</i>         | T |
| Musaceae       | Musa                 | <i>Musa rosacea</i>             | H |
| Myrtaceae      | <i>Syzygium</i>      | <i>Syzygium wallichii</i>       | T |
| Orchidaceae    | <i>Cymbidium</i>     | <i>Cymbidium aloifolium</i>     | O |
|                | <i>Vanda</i>         | <i>Vanda teres</i>              | O |
| Poaceae        | <i>Neonauclea</i>    | <i>Neonauclea sessilifolia</i>  | T |
| Rubiaceae      | <i>Paedaria</i>      | <i>Paedaria foetida</i>         | H |
| Rutaceae       | <i>Zanthoxylum</i>   | <i>Zanthoxylum rhetsa</i>       | T |
| Sterculiaceae  | <i>Pterospermum</i>  | <i>Pterospermum acerifolium</i> | T |
|                | <i>Sterculia</i>     | <i>Sterculia villosa</i>        | T |
| Thymeleaceae   | <i>Aguilaria</i>     | <i>Aguilaria agallocha</i>      | T |
| Vaticaeae      | <i>Vitex</i>         | <i>Vitex quadriangularis</i>    | V |
| Verbenaceae    | <i>Gmelina</i>       | <i>Gmelina arborea</i>          | T |
|                | <i>Vitex</i>         | <i>Vitex diversifolia</i>       | T |
|                | <i>Vitex</i>         | <i>Vitex peduncularis</i>       | T |
|                | <i>Vitex</i>         | <i>Vitex pubescens</i>          | T |
| Zingiberaceae  | <i>Amomum</i>        | <i>Amomum aromaticum</i>        | H |
|                | <i>Amomum</i>        | <i>Amomum corynostachyum</i>    | H |
|                | <i>Hedychium</i>     | <i>Hedychium thyrsiforme</i>    | H |
|                | <i>Curcuma</i>       | <i>Curcuma amada</i>            | H |

Note: T = Tree, S = Shrub, H = Herb

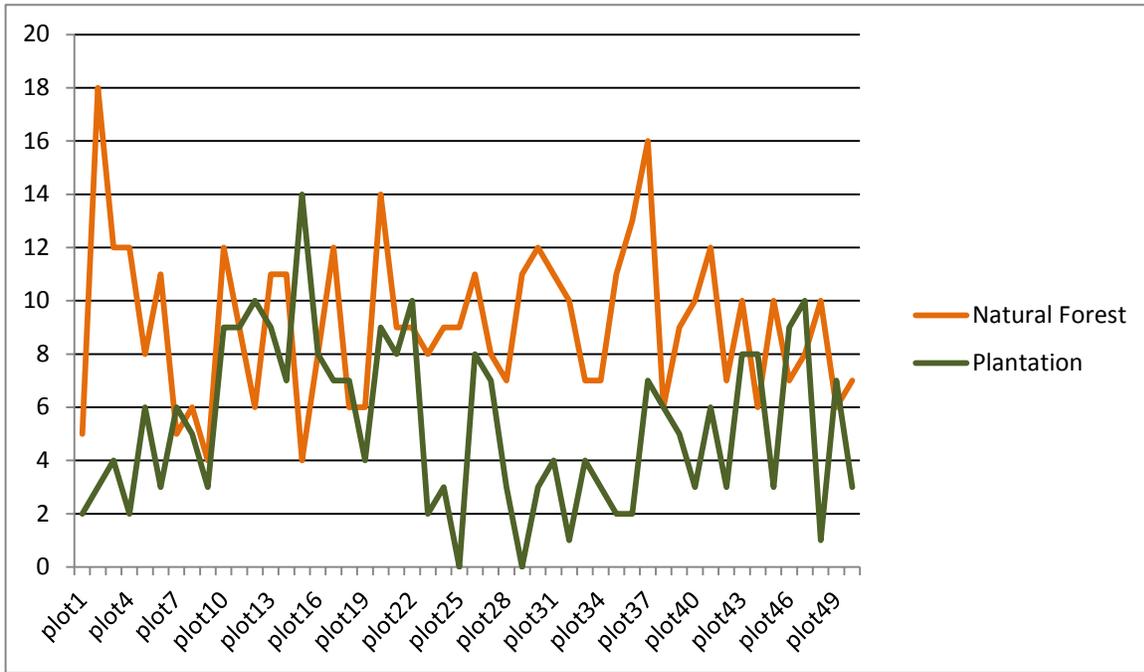


Fig 1a. Species richness

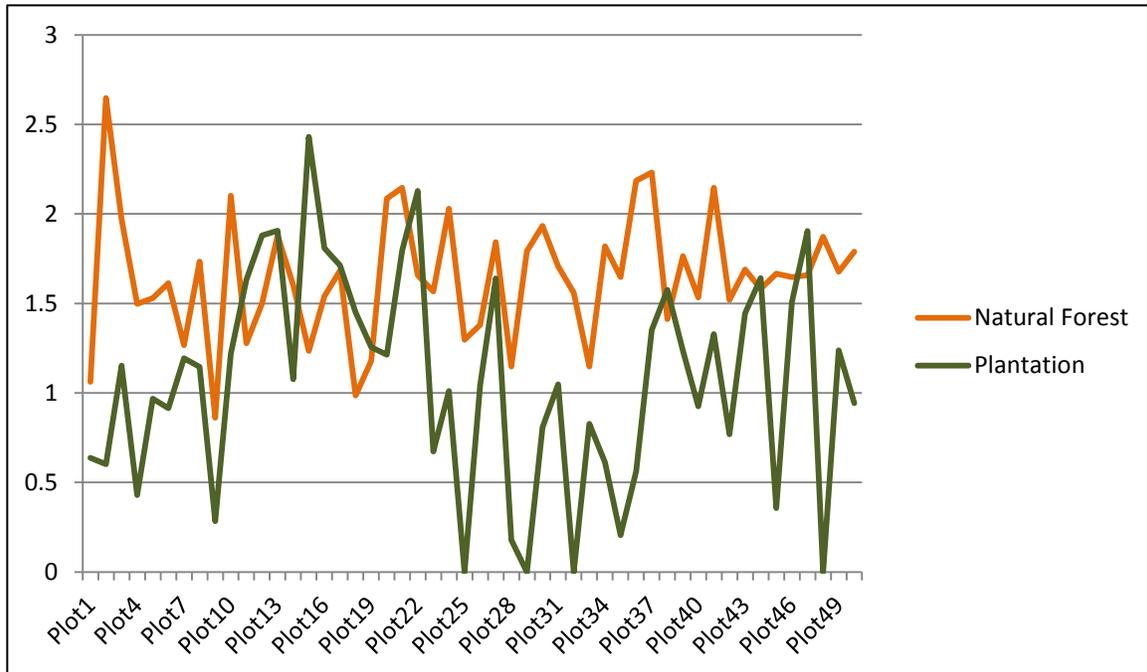


Fig 1b. Species diversity (Shannon-Wiener)

**Hotspots identification**

We identified the rarity hotspots (number = 5) in both natural and plantation forests (Table 2 and Figure 2). The numbers of red listed vascular plants were much higher in the hotspots of the natural forests.

Table 2. Identified hotspot’s location in Rema-Kalenga Wildlife Sanctuary.

| Plot no. (Natural forest)    | GPS position |              | No. of red listed species |
|------------------------------|--------------|--------------|---------------------------|
| Plot 2                       | 24°11.238' N | 91°38.229' E | 18                        |
| Plot 37                      | 24°10.078' N | 91°37.963' E | 16                        |
| Plot 20                      | 24°10.868' N | 91°38.978' E | 14                        |
| Plot 36                      | 24°10'338' N | 91°37'732' E | 13                        |
| Plot 41                      | 24°09.685' N | 91°38.521' E | 12                        |
| Plot no. (Plantation forest) | GPS position |              | No. of red listed species |
| Plot 15                      | 24°12.428' N | 91°37.435' E | 14                        |
| Plot 22                      | 24°12.208' N | 91°37.423' E | 10                        |
| Plot 12                      | 24°13.273' N | 91°37.751' E | 10                        |
| Plot 47                      | 24°09.850' N | 91°36'302' E | 10                        |
| Plot 10                      | 24°11.242' N | 91°38.003' E | 9                         |

Later on, hotspots were mapped on the GIS map using Arc-GIS 9.1 software.

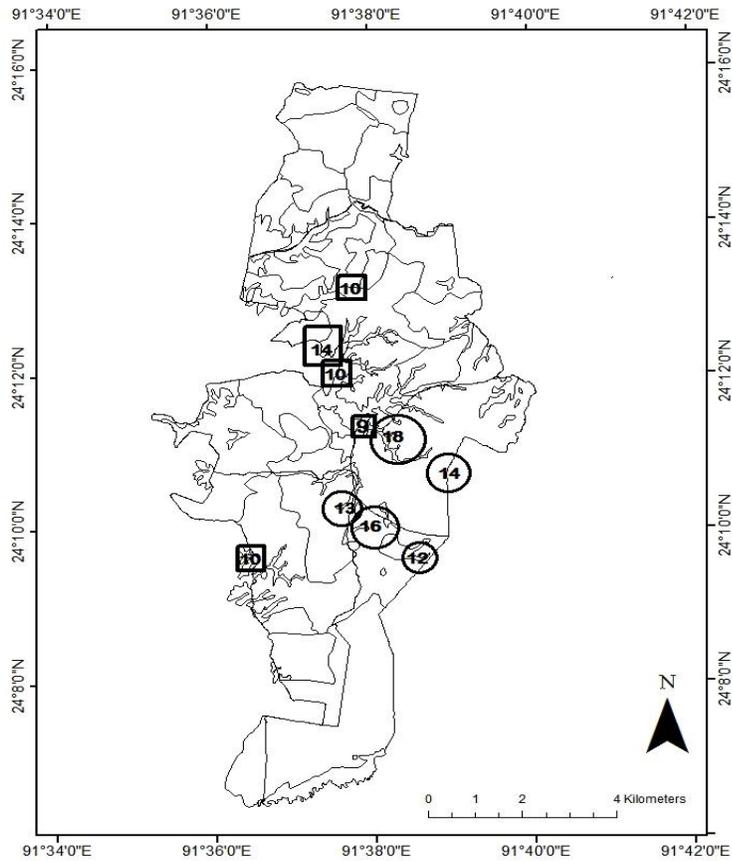


Fig 2. Hotspots in the natural (circles) and plantation forests (boxes). The sizes of the symbols are weighted by the number of red listed plants in the plots.

**Description of few red listed vascular plants**

**Local name:** Bashak

**English name:** White dragon's head

**Scientific Name:** *Adhatoda zeylanica*

**Genus:** Justica

**Family:** Acanthaceae



Fig 3. *Adhatoda zeylanica*

**Botanical description:** A dense, much branched, evergreen shrub, 1-3 m in height. Simple leaves with elliptic or oblanceolate shape. Flower 3-5 cm long, white in axillary leafy bracts. Seed usually 2 or 4, 7×6 mm, sub-orbicular.

**Flowering and fruiting:** January to April.

**Distribution:** In almost all district of Bangladesh.

**Habitat:** On the forest edge, homestead and garden.

**Uses:** leaves used in bronchial troubles and consumption. Leaf juice used in diarrhea, dysentery, influenza and glandular tumors.

**Local name:** Amra

**English name:** Hog plum

**Scientific name:** *Spondias pinnata* (L.f.) Kurz

**Genus:** Spondias

**Family:** Anacardiaceae



Fig 4. *Spondia spinnata*

**Botanical description:** A medium to large size deciduous tree with a pleasant smell (from leaves and twigs). Bark grayish, smooth but often with horizontal winkles and vertical fissures. Leaves imparipinnate, crowded at the end of the branchlets. Inflorescence of 14 – 28 cm long panicles, terminal or axillary. Light yellow flowers on terminal panicles. Fruit a drupe, ovoid, greenish-yellow when ripe, 4-5cm long.

**Flowering and fruiting:** February – August.

**Distribution:** It grows in the forest of Sylhet, Chittagong, Cox's Bazar district, the Chittagong hill tracts, Dhaka, Mymensingh and Dinajpur.

**Habitat:** Homestead, Sal forest and slope of hill forest Sylhet.

**Uses:** Edible fruit. Soft and light wood suitable for light packages, splints and match-boxes.

**Local name:** Chattim

**English name:** Davil's tree

**Scientific name:** *Alstonia scholaries* L.

**Genus:** Alstonia

**Family:** Apocynaceae



Fig 5. *Alstonia scholaries*

**Botanical description:** A tall tree. Leaves 5 to 10 in a whorl, elliptic-oblong, petioles up to 1.7 cm long. Flowers greenish white, 6 to 12 mm long. Seed obtuse at the both end.

**Habitat:** In wild occurs in evergreen, deciduous and mixed forest. For plantation roadsides and home gardens are suitable.

**Distribution:** occurs naturally in the forest in eastern parts of the country. Now it is widely cultivated throughout the Bangladesh.

**Use:** Bark has medicinal value. Relatively low density wood and used for making packing boxes, furniture, coffins, pulp and paper.

**Local name:** Bankachu

**English name:** Not known

**Scientific Name:** *Aglaonema hookerianum* Schott.

**Genus:** *Aglaonema*

**Family:** Araceae

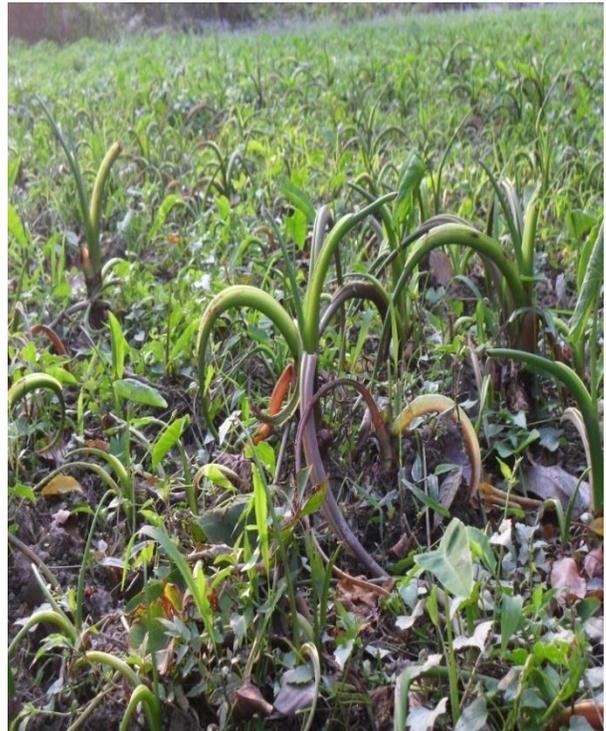


Fig 6. *Aglaonema hookerianum*

**Botanical description:** An annual herb. Stem 1 cm diameter, apparently 40 to 50 cm tall. Leaf simple, ovate to elliptic, slightly asymmetric, shortly acuminate. Spathe green, convolute at base, open above. Spadix long stipitate. fruit berry, bright red.

**Flowering and fruiting:** June to July

**Habitat:** Shady area in deep forest, on the hill slope near the stream.

**Distribution:** Chittagong, Sylhet and Chittagong (Sitakunda), Bandorban and Rangamati (along Kasalongriver).

**Uses:** The sap from the root is taken for conjunctivitis and constipation. A leaf extract is taken and a paste of the leaves is applied to the whole body for the treatment of hysteria.

**Local name:** Tara

**English name:** Not known

**Scientific Name:** *Amomum aromaticum* Roxb.

**Genus:** *Amomum*

**Family:** Zingiberaceae



Fig 7. *Amomum aromaticum*

**Description:** A medium sized perennial rhizomatous herb. Leaf oblong-lanceolate, Leaf arrangement alternate, Spike from the base of the plant. Calyx tube 3-lobed. Corolla tube pubescent. Flower yellow color. Fruit ovate, conical, purplish-black, type of fruit. Seed angular, 2.5-3.0 mm long, black, aromatic, covered with white aril.

**Flowering and fruiting:** August- June

**Habitat:** On the Hill slope.

**Distribution:** In Bangladesh in the hilly areas of Chittagong, Cox's Bazar, Rangamati, Maulvibazar, Sylhet and Rangpur district.

**Uses:** The seeds somatic, appetizer, tonic for heart and liver, also used as spice. The oil of seed content cineol and applied to the eye inflammations The husk is mixed with cattle feed in powdered form.

**Local name:** Anna

**Scientific name:** *Antidesma ghaesembila* Gaertn.

**Genus name:** *Antidesma*

**Family:** Euphorbiaceae



Fig 8. *Antidesma ghaesembila*

**Botanical description:** A deciduous shrub or small tree, up to 8 m high. Leaves broadly obovates or oblong .4 -10×2-6 cm, obtuse. Flower sessile. Fruits about 4mm long, subglobose, 1-seeded.

**Flowering and Fruiting:** January – May.

**Habitat:** On the edge of the forest area.

**Distribution:** occurs almost throughout the country

**Use:** The bark is considered astringent and tonic.

### **Outputs**

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We submitted an article with partial results from this project titled on “Tree ring research in Bangladesh - A synthesis” in *Tree ring research*.

### **Next Steps....**

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Now we are planning to arrange a workshop with other interested parties. We hope to come up with more information that will help in taking initiatives to conserve these threatened species soon.