



TONGLU MEDICINAL PLANTS CONSERVATION AREA (MPCA) WEST BENGAL



Spatial Distribution Map of Tonglu MPCA in West Bengal

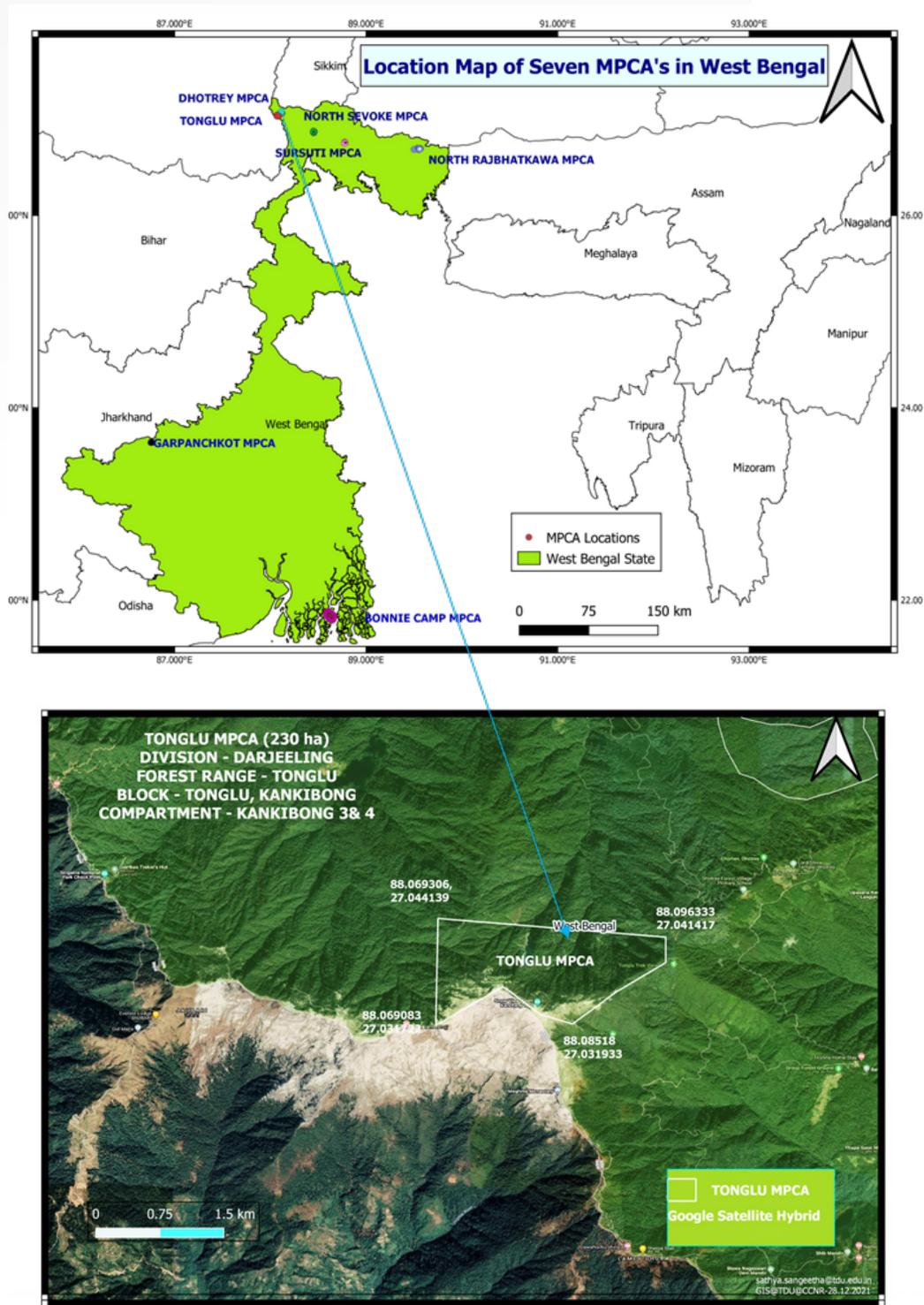


Fig. No.1: Spatial distribution Map of Tonglu demarcating the area under the MPCA.

MPCAs as an inventive tool for Forest Biodiversity Conservation in West Bengal

The state of West Bengal is blessed with varied phytogeography that allows it to host a diverse range of plants and animals. The state has 11, 879 sq. km of forested area of which 39.50% is under protected area network. In 2007-09, seven (7) Medicinal Plant Conservation Areas (MPCAs) were established in the State for promoting Conservation of Medicinal Plants and Traditional Knowledge for enhancing health and livelihood security of the surrounding indigenous communities. In the face of global warming and climate change the MPCA's can act as buffers for carbon sequestration, habitat protection, gene pool conservation, health and poverty issues and other ecosystem services. Each MPCA can act as a permanent plot for future assessments on impact of climate change on forest ecosystems. Awareness regarding the objectives and presence of the MPCA's is of paramount importance to meet the Sustainable Development Goals (SDG) of UN. A pictorial guide book of the medicinal plants of the MPCA's and their IUCN status is a prerequisite for facilitating the conservation initiatives of every MPCA of the 7 MPCA's in the State of West Bengal; three were established in North Bengal, namely North Sevoke, Sursuti and North Rajabathkhawa; two in Darjeeling Hills namely Dhotrey and Tonglu MPCA and two in South Bengal namely Bonnie Camp in Sundarbans and Garpanchakot in Purulia. The Tonglu MPCA has an area of 230 ha in the Tonglu Forest Range of Tonglu, Kankibong Block of Darjeeling.

Table 1. Community, Phytogeographic, Climatic, Edaphic and Administrative profile of Tonglu MPCA.

Community	
The people residing adjacent to the MPCA are mostly Nepali and Bengali communities.	The major livelihood sources are Home stay and tourism, animal husbandry, forest dept daily wage labour, eco-tourism guide, government jobs
Phytogeography	
Lat- N 27 °02' Long- E 88 ° 05' Forest Type – As per Champion & Seth's Classification: 3C North India Wet Temperate Montane	Dominant tree species (as per VI values) <i>Viburnum erubescens</i> <i>Rhododendron griffithianum</i> <i>Neolitsea cuipala</i> <i>Rhododendron arboretum</i> <i>Lithocarpus pachyphyllus</i> <i>Symplocos lucida</i> <i>Pieris formosa</i> <i>Daphne papyracea</i> <i>Litsea sericea</i> <i>Gamblea ciliata</i>
Climatic Condition	
Temperature in o C Max – 21 Min – 8.7 Average Rainfall (mm) : 3624.2 unit	Spring- January to February Summer- March-May Monsoon- June-September. Winter –October to January.
Edaphic Condition	
Soils are sandy loam, Red and yellow podzolic soil.	
Administration	
The MPCA comes under Biodiversity and Wildlife Conservation and Preservation Working Circle and managed by the Forest Protection Committee (FPC) of Dhotrey and Reling FPCs.	This Working Circle coordinates research, extension, land use, soil conservation, planning and educational activity through specialized agencies and line departments.

The Tonglu MPCA harbours 301 medicinal plants. About 5 plants of this plant community are critically endangered, 3 are endangered and 2 are vulnerable (Table 2).

Table 2: Medicinal plants of conservation concern in Tonglu MPCA.				
Sl. No	Sc. Name	Family	Habit	Status
1	<i>Acer pectinatum</i> Wall. ex G.Nicholson	Sapindaceae	Tree	Rare
2	<i>Aconitum ferox</i> Wall. ex Ser.	Ranunculaceae	Undershrub	Common, Endangered
3	<i>Aconitum palmatum</i> D.Don	Ranunculaceae	Undershrub	Less common, Endangered
4	<i>Aconitum spicatum</i> (Brühl) Stapf	Ranunculaceae	Undershrub	Rare, Endangered
5	<i>Agrimonia pilosa</i> var. <i>nepalensis</i> (D. Don) Nakai	Rosaceae	Herb	Rare
6	<i>Arisaema nepenthoides</i> (Wall.) Mart.	Araceae	Herb	Rare
7	<i>Aristolochia griffithii</i> Hook.f. & Thomson ex Duch.	Aristolochiaceae	Climber	Rare
8	<i>Berberis aristata</i> DC.	Berberidaceae	Shrub	Common, Vulnerable
9	<i>Clematis buchananiana</i> DC.	Ranunculaceae	Climber	Rare
10	<i>Dichroa febrifuga</i> Lour.	Hydrangeaceae	Herb	Rare
11	<i>Euonymus echinatus</i> Wall.	Celastraceae	Undershrub	Rare
12	<i>Evodia lunu-ankenda</i> (Gaertn.) Merr.	Rutaceae	Tree	Rare
13	<i>Exbucklandia populnea</i> (R.Br. ex Griff.) R.W.Br.	Hamamelidaceae	Tree	Rare
14	<i>Gentiana pedicellata</i> (D.Don) Griseb.	Gentianaceae	Herb	Rare
15	<i>Herminium clavigerum</i> (Lindl.) X.H.Jin, Schuit., Raskoti & Lu Q.Huang	Orchidaceae	Herb	Rare
16	<i>Hypericum choisanum</i> Wall. ex N.Robson	Hypericaceae	Shrub	Rare
17	<i>Impatiens racemosa</i> DC.	Balsaminaceae	Herb	Rare
18	<i>Magnolia globosa</i> Hook.f. & Thomson	Magnoliaceae	Tree	Rare
19	<i>Neohymenopogon parasiticus</i> (Wall.) Bennet	Rubiaceae	Undershrub	Rare
20	<i>Panax pseudoginseng</i> subsp. <i>himalaicus</i> H.Hara	Araliaceae	Herb	Rare, Critically Endangered
21	<i>Picrorhiza kurroa</i> Royle ex Benth.	Plantaginaceae	Herb	Less common, Critically Endangered
22	<i>Podophyllum hexandrum</i> Royle	Berberidaceae	Herb	Less common, Critically Endangered
23	<i>Rhododendron triflorum</i> Hook.f.	Ericaceae	Shrub	Rare
24	<i>Schisandra neglecta</i> A. C. Smith	Schisandraceae	Shrub	Rare
25	<i>Skimmia laureola</i> Franch.	Rutaceae	Shrub	Rare
26	<i>Sorbus foliolosa</i> (Wall.) Spach	Rosaceae	Tree	Rare
27	<i>Swertia bimaculata</i> (Siebold & Zucc.) Hook.f. & Thomson ex C.B.Clarke	Gentianaceae	Tree	Less common, Critically Endangered
28	<i>Taxus wallichiana</i> Zucc.	Taxaceae	Tree	Less common, Critically Endangered
29	<i>Thalictrum foliolosum</i> DC.	Ranunculaceae	Herb	Less common, Vulnerable
30	<i>Zeuxine goodyeroides</i> Lindl.	Orchidaceae	Herb	Rare

Rare (<50 plants), Less common (< 100 plants), Common (<500 plants), NR (Newly Recorded).

The Tonglu MPCA has a very healthy ecosystem with around 8 species of orchids such *Herminium clavigerum*, *Liparis*

petiolata, *Peristylus biermannianus*, *Platanthera urceolata*, *Pleione hookeriana*, *Pleione praecox*, *Satyrrium nepalense* and *Zeuxine goodyeroides*. It has a rich assemblage many species of *Berberis* (7 species), *Primula* (7 species), *Rhododendron* (6 species) and others. However, these species have small population in the MPCA. The critically endangered species such as *Swertia chiriyta*, *Podophyllum hexandrum*, *Picrorhiza kurroa*, *Panax pseudoginseng*, *Taxus wallichiana* are growing in small populations in the MPCA. The MPCA acts as a *in-situ* conservation area for such endangered species with high conservation concern. On the other hand *Aconitum ferox* which is an endangered species is commonly found with a good population in the MPCA.

The community adjacent to the Tonglu MPCA collect fuelwood, fruits and medicinal plants from the areas adjoining the MPCA. The medicinal plants growing in the neighbourhood of the MPCA are used for treating ailments such as epilepsy, antidote, cancer, jaundice, gynecological infections, diabetes, cough and cold, diarrhoea and dysentery, nose bleeding, T.B., kidney problem, aphrodisiac, blood purifier, gynecological infections, tonsillitis, fever, joint pain, bone fracture, skin disease, arthritis, ulcer, stomach ailment and as food item (Table 3).

Botanical name	Local Name	Medicinal use	Local use/traded
<i>Aconitum ferox</i>	Bikhma	Plant used to treat food poisoning.	Locally used
<i>Aconitum heterophyllum</i>	Bikhma	Tuber used against food poisoning and as antidote.	Locally used
<i>Acorus calamus</i>	Bojo/Boch	Root used to treat wound, skin disease and itching.	Locally used
<i>Actinidia callosa</i>	Thekiphal	Fruits used to prepare local drinks to treat cough and cold, asthma and dysentery.	Locally used, traded
<i>Allium wallichii</i>	Jangli dung dung/Gokpa	Plant used in stomach ache, bacterial and microbial infection in nail or skin; gastritis.	Locally used
<i>Artemisia vulgaris</i>	Tite pat	Leaves used to treat blood pressure; cough and cold, nose bleeding, skin oil, joint pain ointment.	Locally used
<i>Astilbe rivularis</i>	BuroUkhoti/ Bon supari	Roots treat tooth gum, mixed with ghee and butter for new mother; relieves body, diarrhoea and dysentery.	Locally used
<i>Berberis aristata</i>	Kesari	Leaves treat diabetes; bark treats jaundice.	Locally used, traded
<i>Bergenia ciliata</i>	Pakhanbhed	Roots used in back and joint pain; diarrhoea and body pain.	Locally used
<i>Dactylorhiza hatagirea</i>	Panchungli	Roots applied in cuts and wounds.	Locally used
<i>Equisetum sp.</i>	Kukurejhar	Roots used to treat kidney problem.	Locally used
<i>Eupatorium odoratum</i>	Bonmara/ kalijhar	Leaves used as antiseptic; used in cut and wound.	Locally used
<i>Evodia lunu-ankenda</i>	Khanakpa	Bark used in kidney problem; fruits used in gastritis, cough, fever & body ache.	Locally used, traded
<i>Hemiphragma heterophyllum</i>	Kakmala	Roots and fruits treat tonsillitis.	Locally used
<i>Heracleum wallichii</i>	Chimphing	Roots used in cough, fever, body ache, joint pain; Leaves and flower eaten in gastritis, body pain; fruits treat high altitude sickness and acidity.	Locally used
<i>Holboella latifolia</i>	Gophla	Ripen fruits are good for constipation.	Locally used
<i>Juglense regia</i>	Okkhor	Plants used in enhancing memory and for good health.	Locally used, traded
<i>Lyonia ovalifolia</i>	Angeri	Leaves applied for skin disease and itching.	Locally used, traded
<i>Nasturium officinale</i>	Simrayo	Leaves boiled and given in T.B. and chest pain; jaundice; raw leaf juice given in tuberculosis.	Locally used
<i>Panax-pseudo ginseng</i>	Salaney	Rhizome gives good health and used as aphrodisiac.	Locally used, traded
<i>Paris polyphylla</i>	Satwa	Roots used as antidotes; for treatment of boil.	Locally used, traded

<i>Picrorhiza kurrooa</i>	Kutki	Roots and rhizome used in body ache and fever.	Locally used, <i>traded</i>
<i>Podophyllum hexandrum</i>	Papari	Plant used for treatment of skin scars; used in gynaecological infections and other sexual infections; roots as blood purifier.	Locally used, <i>traded</i>
<i>Swertia chirayita</i>	Chiroto	Whole plant used in fever.	Locally used, <i>traded</i>
<i>Taxus wallichiana</i>	Dhangre Salla	Cancer, joint pain, decoction of leaves in body pain; decoction given in high blood pressure.	Locally used, <i>traded</i>

The plants that are in the critically endangered category such as *Swertia chirayita* and *Panax pseudoginseng*, *Podophyllum hexandrum* and *Taxus wallichiana* are also used locally and traded for their medicinal purposes. Awareness among the ground level workers of the forest department and the local community can help in the conservation of these species in the MPCA and its surrounding area.

Picrorhiza kurrooa and other medicinal plants that are threatened and have small population in the MPCA require attention of all stake holders. The Tonglu MPCA acts as a genepool for such endangered species. The Tonglu MPCA could be the cradle of speciation of the genus *Primula*, *Berberis* and *Rhododendron* that have a large number of species in the MPCA. Alternate livelihood sources can be generated by the local people by creating home nurseries of such medicinal plants. Further value addition to medicinal plant part can reduce extraction pressure on the local biodiversity and also improve local economy. The MPCA can act as a major ecological and economic tool for the sustainable development of surrounding areas specially with respect to various ecosystem services.

Aconitum ferox Wall. ex Ser.



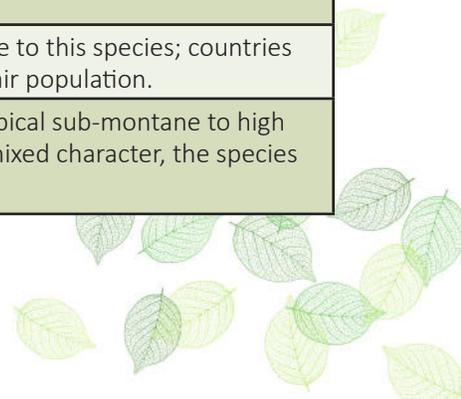
Common Name	Bikhuma, Vatsanabhi, Mithazahar
Family	Ranunculaceae.
Habitat and Distribution	The species is native to the eastern Himalayas; distributed in central Nepal and Bhutan eastward through Indian states of West Bengal, Sikkim and Arunachal Pradesh.

Ecology:	This species is tolerant of a wide range of soil types and usually found in the alpine vegetation; flowers are pollinated by bees.
Threat status	Endangered (EN) in Darjeeling Himalaya of West Bengal.
Description	It is an erect, biennial tuberous rooted herb, growing about 2 m tall and 0.5 m wide. Roots are tuberous, found in pairs and daughter tubers are with fibrous roots; leaves are round or kidney shaped, 8-15 cm broad, 5 lobed. Flowers are blue, borne on 10 to 15 cm long, terminal racemose inflorescences. Fruits are follicles which are in groups of 5 numbers and finely hairy. Seeds are inverted egg shaped and winged along ridges.
Flowering and fruiting	Flowering during July to August and Fruiting September to October
Uses	The plant tuber is used for the treatment of fever, diabetes and headache, and as a rejuvenator. It is an important medicinal plant used in Ayurveda for treatment of fever and inflammatory conditions. This plant is one of the most ancient home remedies for fever. It has a diuretic action, causes bradycardia and reduces sweating.
Trade information	This is one of the highly traded medicinal plants. Around 100-200 MT is consumed by the domestic herbal manufacturing units.
Propagation and cultivation	Seeds, tuber segments or young leafy stems used as propagules.

Taxus wallichiana Zucc.



Common Name	Yew, Talisapatra, Dhyangre Sallah
Family	Taxaceae
Habitat and Distribution	The Himalayan region and areas of Southeast Asia are home to this species; countries such as Afghanistan, India and Southwest China harbours fair population.
Ecology:	Growing in montane, temperate, warm temperate, and tropical sub-montane to high montane forests that may be deciduous, evergreen, or of mixed character, the species prefers a fairly wide range of environments.



Threat status	Critically Endangered (CR) in West Bengal.
Description	It is a medium-sized evergreen coniferous tree that can reach a height of 10 meters; stem having dark reddish grey bark and profuse branching. Leaves are linear, 2-3 cm long 0.3 cm broad, flat, curves spine-tipped leathery dark glossy green. Male and female cones are usually borne on separate trees. Male cones are 5-6 mm long with empty bracts and the axis ending in a round cluster of stamens; female cones are solitary and axillary and each consisting of few imbricate scales.
Flowering and fruiting	Flowering March to April and seed ripens from September to November
Uses	Taxus wallichiana is used for making tea by the Bhotiya tribal community in the Garhwal Himalaya. In Arunchal Pradesh, local people feed their cattle for better milk production; leaves are used for treatment of asthma, bronchitis, epilepsy; taxol extracted from this plant is used in treatment of tumours and specific kind of cancer.
Trade information	This is one of the highly traded medicinal plants of India. The estimated consumption rate is around 200 MT per year.
Propagation and cultivation	Vegetative propagation by stem cuttings; Seed germination is good in natural condition.

Aconitum palmatum D. Don



Common Name	Bikhma, Monksood
Family	Ranunculaceae.
Habitat and Distribution	The species is native to the Himalayas to Tibet and Myanmar; In India, distributed in Western Himalaya (alpine region of Uttarakhand), Sikkim, Arunachal Pradesh and the north of West Bengal; found in the sub-alpine to alpine region.
Ecology:	This species is a biennial and hermaphrodite; flowers are pollinated by bees.
Threat status	Endangered (EN) in Darjeeliling Himalaya of West Bengal.

Description	It is herbaceous biennial plant with an erect, branchless or so stem 60-120 cm tall; the stem grows from a biennial tuberous root that produces a new tuber each year, the old tuber dying after the plant flowers; Flowers in ca. 20 cm long panicle; sepals bluish, white. Follicles smooth; seeds are blackish, ovoid and about 3 mm long, round in cross section, winged.
Flowering and fruiting	July--November
Uses	The plant root is antiperiodic and tonic; used for the treatment of rheumatism and diarrhoea.
Trade information	Roots are collected and sold to the medicinal plants traders in Siliguri and other mandis (raw drug market).
Propagation and cultivation	Seeds best sown as soon as it is ripe. The stratified seeds are sown in spring.

Podophyllum hexandrum Royle



Common Name	Papra, Bankakri, Vanatrapusi, Himalayan Mayapple
Family	Podophyllaceae
Habitat and Distribution	Himalayan region of India and China up to 2500-4000m altitude.
Ecology:	In comparison to other relatives of this species, persistence of <i>P. hexandrum</i> in natural condition is attributable to Self compatibility, the capacity for selfing in an unpredictable pollination environment.
Threat status	Critically Endangered (CR) in Darjeeling Himalaya of West Bengal.

Description	Succulent erect herb having unbranched stem, bearing two large lobed leaves at the top, encircling the single large, white or pale pink cup shaped flower; flower is 2-4 cm across with 3 sepals which fall off soon; leaves are rounded in outline; flower has six petals and six stamens; fruit is a large scarlet or reddish berry, 2.5-5 cm with many seeds embedded in pulp.
Flowering and fruiting	April--July
Uses	The rootstocks collected from this species is used as a purgative and also for treatment of vaginal warts . Two derivatives of podophyllotoxin, called eloposide and teniposide are employed for treatment of cancers . Root paste is applied on ulcers, cuts and wounds .
Trade information	Rootstocks are traded in the national and international market.
Propagation and cultivation	It can be propagated with seeds or by rootstocks/rhizomes.

Rhododendron arboreum Sm.



Common Name	Gurans, Goras
Family	Ericaceae
Habitat and Distribution	It is found in Bhutan, China, India, Myanmar, Nepal, Sri Lanka, Pakistan and Thailand. It is native to Himalayas, from Kashmir eastwards to Nagaland.
Ecology:	It is found in a community of associated species such as Quercus spp. and Pinus roxburghii. It thrives best on moist loamy soil although it is also found on moist rocky ground.
Threat status	Least Concern (LC) (G) and Not Evaluated (NE) in West Bengal
Description	It is an evergreen shrub or small tree. It has broad, dark green leaves, 3-7 in long, The flowers of R. arboreum range in color from a deep scarlet, to red with white markings, pink to white. In early- and mid- spring trusses of 15-20 bell-shaped flowers, 2inch wide and 1.25-2inch long are produced in scarlet color. They have black nectar pouches and black spots inside. Fruit Capsule-curved central column composed of fine lobes, ribbed, up to 3.8 cm long and 1.25 cm wide.

Flowering and fruiting	Flowering season is from March-April/ June-September
Uses	Flowers are eaten as pickles. A sub-acidic jelly is made from the petals. Juice and local drink is prepared from the red flower. The tincture of dried leaves has been used in gout. Leaves are applied to the forehead to relieve headache . Parts are used in the treatment of diarrhoea and dysentery .
Trade information	Local drinks made out of red flowers are sold in the local market, served to the tourist in the home stay. Fuel wood and charcoal are sold in the local market.
Propagation and cultivation	Although they produces seeds most rhododendrons are propagated from stem cuttings .

Paris polyphylla Sm.



Common Name	Satuwa, Daiswa paris, Svetavaca,
Family	Liliaceae
Habitat and Distribution	Native to China, Taiwan, the Indian Subcontinent, and Indo-china.
Ecology:	It is a slow-growing perennial; grows well in wet soil having full or partial shade, well drained rich humus soil in a community of many key associated species such as <i>Quercus sp</i> , <i>Taxus wallichiana</i> , <i>Aconitum spp</i> . and <i>Smilax sp</i> . species; it shows healthy growth as well as reproduction in undisturbed area with canopy covers over 80%.
Threat status	Endangered (EN) in West Bengal and Vulnerable (VU).
Description	This plant can reach a height of 90 cm and a width of 30 cm. It has a single whorl of leaves beneath a bloom with two whorls. It is a perennial herb of 10-60 cm tall; rootstock thick, creeping, Leaves in a whorl at the summit of stem, lance shaped; Flowers solitary in centre of leaf whorl, outer tepals green; inner ones yellow or purple green; Capsules 4-5 valved, yellow brown; Seeds scarlet, shining.
Flowering and fruiting	Flowering April to May and matured fruits and seeds found in October to November.
Uses	Rhizomes are used in liver cancer , in burns , cuts , diarrhea, dysentery, fever and stomachache ; It is also utilised as a decorative plant in gardens under deciduous trees;

Trade information	It is one of the highly traded medicinal plants; dried rhizomes are sold as high as Rs 4000/kg
Propagation and cultivation	Rate of seed germination is low in natural condition; propagated with seeds and vegetative propagation by rhizome cuttings.

Magnolia campbellii Hook.f. & Thomson



Common Name	Magnolia
Family	Magnoliaceae
Habitat and Distribution	This species grows well in the sheltered valley in the Himalayas; eastern Nepal, east to southwest China, south to northern Myanmar.
Ecology:	Pollination is entomophilous i.e., by insects. This species is domesticated as ornamental plant due to its beautiful and fragrant flowers.
Threat status	Least Concern (LC)
Description	<i>Magnolia campbellii</i> is a medium-sized to large deciduous tree growing to 30 m, rarely to 45 m tall, with smooth grey bark. Leaves simple, alternate, entire, up to 10-23 cm long and 4.5 to 10 cm broad; buds enclosed in large convolute stipules which are connate in pairs, where stipules are free or adnate from petiole; flowers are very large 15-25 cm diameter, with 12-16cm tepals which vary from white to dark pink. After opening, the innermost tepals remain erect while the other spread widely; flowers are complete, bisexual, i.e., with functional male (androecium) and female (gynoecium), including stamens, carpels and ovary.
Flowering and fruiting	February-October.
Uses	Cultivated as ornamental. Bark of <i>Magnolia campbellii</i> is used to treat asthma, blood problems, headache.
Trade information	This plant is propagated and sold in the plant nurseries.

Propagation and cultivation	Propagated by seeds sown in Autumn. Seed must go through the process of stratification in order to germinate.
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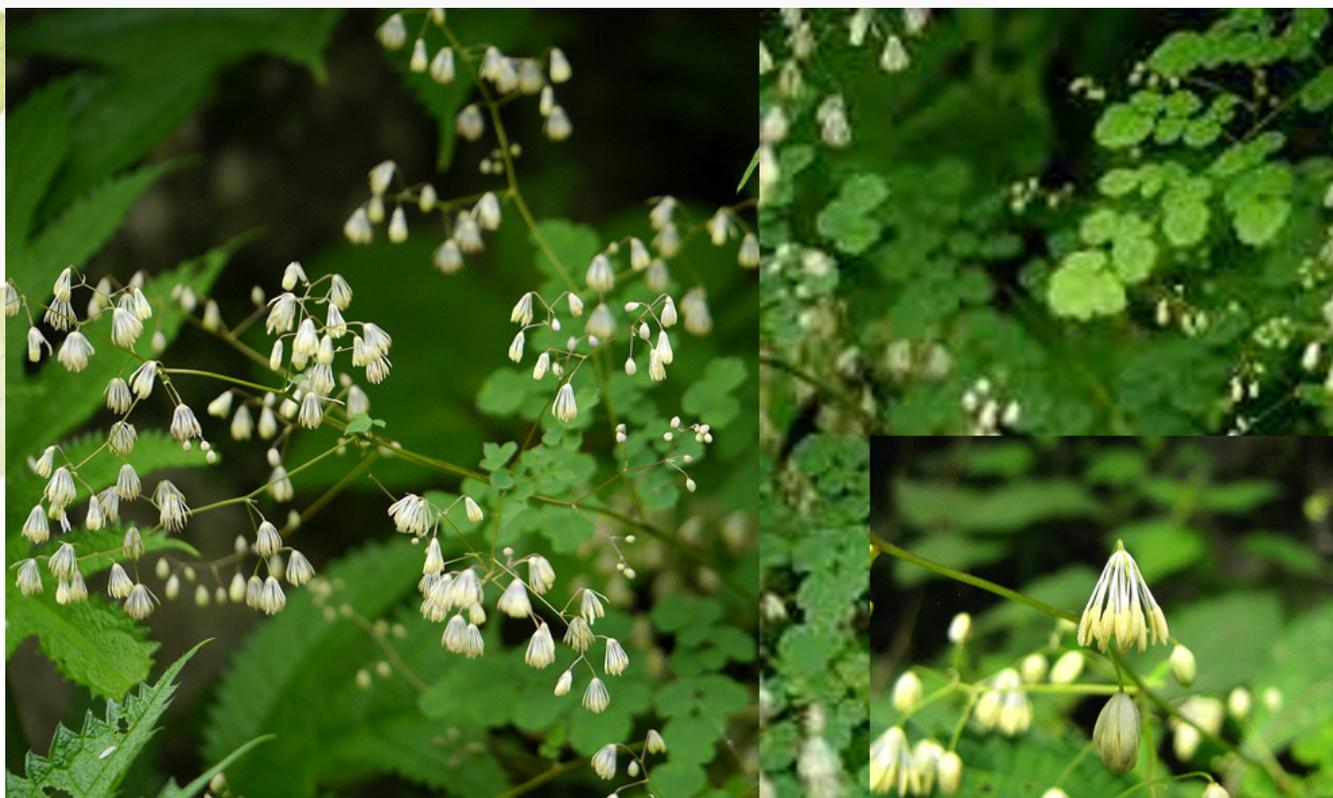
Aconitum spicatum (Brühl) Stapf



Common Name	Nilo Bikh, Aconite, Queen of poisons.
Family	Ranunculaceae
Habitat and Distribution	Alpine regions at elevations between 3,000 - 5,000 metres. East Asia particularly in Himalayas in Nepal, Sikkim and south Tibet.
Ecology:	This species is tolerant of a wide range of soil types and usually found in the alpine vegetation; flowers are pollinated by bees.
Threat status	Endangered (EN) in Darjeeliling Himalaya of West Bengal.
Description	It is a perennial herb with an erect, branchless or nearly so, stem 60 - 120cm tall. Roots, biennial, paired, tuberous; conical or cylindrical 4-10 cm long. Stem erect; leaves scattered, upto 10, glabrous, or the upper most finely pubescent on the nerves below; blade orbicular-cordate to reniform, 3-lobed. Inflorescence a very loose, leafy panicle or raceme, 10-20 cm long. Sepals bluish or variegated white and blue, uppermost helmet-shaped. Carpels 5, sub contiguous in the flower. Follicles sub contiguous or somewhat diverging in the upper par. Seeds blackish, ovoid, about 3 mm long, round in Cross section.
Flowering and fruiting	It flowers from August – September
Uses	The root is antiperiodic and tonic. It is used in the treatment of rheumatism and diarrhea. It is said to be a strong bitter, like quinine, and very powerful in the cure of fevers
Trade information	This is among the ten most traded medicinal plants from the Himalayan region.
Propagation and cultivation	Propagated by Seed. The stem grows from a biennial tuberous root that produces a new tuber each year, the old tuber dying after the plant flowers.



Thalictrum foliolosum DC.



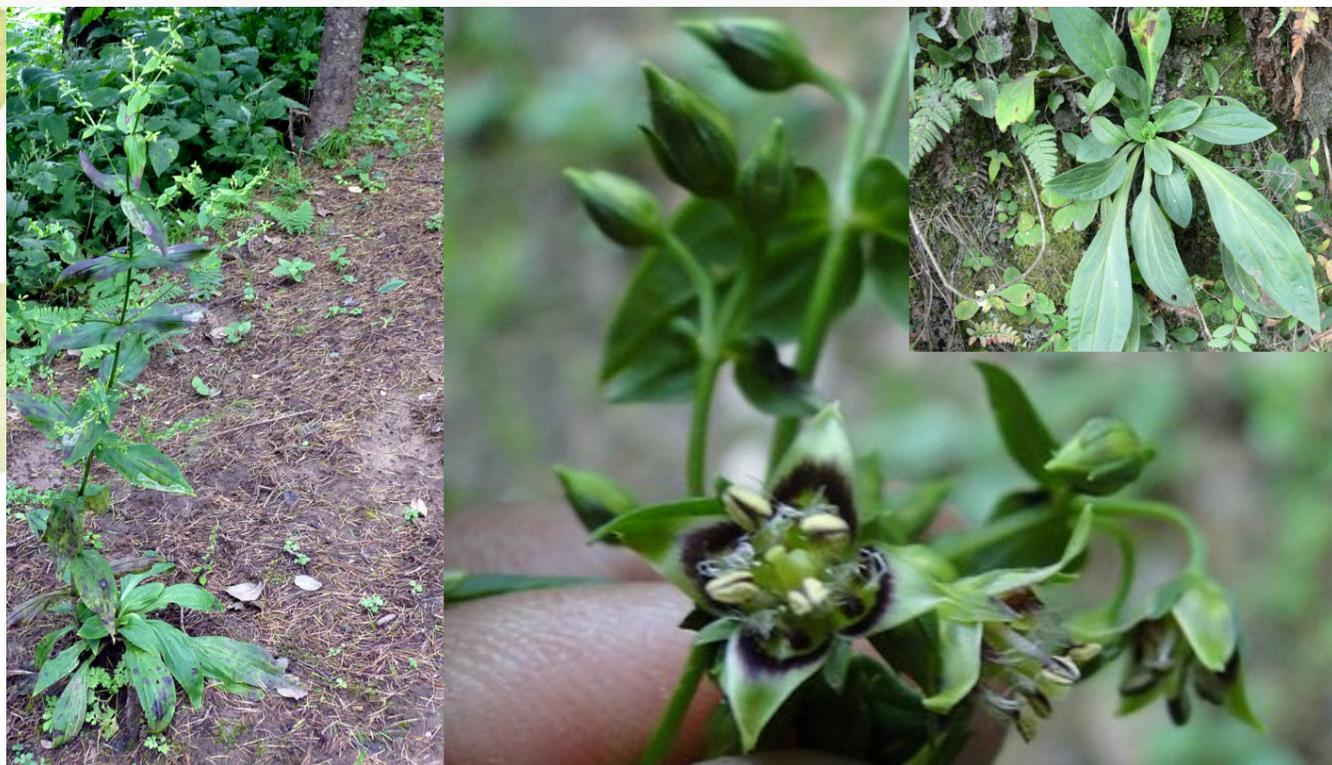
Common Name	Mamiraa, Penyaale, Daamapaatee
Family	Ranunculaceae
Habitat and Distribution	<i>Thalictrum foliolosum</i> is found in the range from Kashmir to South East Tibet, Burma. In India, it is available in the temperate Himalayas from 1500-2400m in the Khasi hills and in Kashmir, Uttar Pradesh and West Bengal.
Ecology:	This species is a hermaphrodite and is pollinated by insects and wind.
Threat status	Vulnerable (VU) in West Bengal
Description	A perennial erect herb up to 1- 2 m tall. Roots biennial, paired, tuberous, dark brown. Leaves palmately 5-fid, lobes, ovate- cuneate, deeply incised. The flowers are small, white to dull greenish-purple, many in much-branched often dense clusters borne on tall leafy stems 1.2-2.6 m. Petals are ovate, 3-5 mm, green; stamens much longer, filaments white. Leaves are 15-45 cm, many times divided into oblong-ovate, rounded-toothed, 3-lobed leaflets 1-1.5 cm. Achene are 2-5, ellipsoid, seeds strongly ribbed, stalkless; beak curved.
Flowering and fruiting	July-September.
Uses	It is traditionally used as a tonic , antiperiodic, diuretic, febrifuge, purgative and stomachic and for the treatment of snakebite, jaundice and rheumatism .
Trade information	Although this species is not highly traded one, however, the roots are collected and traded at local and national level.
Propagation and cultivation	Propagated by seeds

Abies densa Griff



Common Name	Gobra, Gobria, Salla, Silver fir.
Family	Pinaceae
Habitat and Distribution	<i>Abies densa</i> is a dominant conifer in the upper coniferous belt of the central and eastern Himalayas from Nepal, India, Bhutan, and adjacent Tibet to Burma (Myanmar) in altitudes between 2800 and 3700 m. In India it is found in Darjeeling Himalaya and Sikkim.
Ecology:	It occurs in moist coniferous forests at 2,450 to 4,000 m elevation, commonly covering large areas as pure stands, often with an understory of <i>Rhododendron spp.</i> , at lower levels mixed with <i>Conium maculatum</i> the Hemlock.
Threat status	Not Evaluated (NE)
Description	It is a tree up to 30–40 m, with trunk diameters sometimes reaching 2.5 m. The bark is breaking to thick angular plates, the branchlets light greyish-yellow when young, later grayish-brown to gray. The needles are up to 4.5 cm long, with somewhat recurved margins. The cones are up to 10 cm long, bluish grey or dark blue to bluish brown, with bract length varying among individuals.
Flowering and fruiting	Flowering from April to May
Uses	The leaves are astrigent , carminative, expectorant, stomachic and tonic . The leaf juice used in the treatment of asthma, bronchitis etc. An essential oil obtained from the leaves is used to treat colds, rheumatism and nasal congestion . The leaf juice is antiperiodic; timber is used in construction and ornamental designs.
Trade information	Leaves are used locally. Timber is in trade at local and national level.
Propagation and cultivation	Propagated by seeds

Swertia chirayita (Roxb. Ex Fleming.)H. Karst.



Common Name	Chirayita, Charata
Family	Gentianaceae
Habitat and Distribution	India, Nepal, Bhutan; indigenous to the temperate Himalayas from Kashmir to Darjeeling to Arunachal Pradesh.
Ecology:	<i>Swertia chirayita</i> populations grow mostly on south-east slopes in <i>Acer</i> and <i>Quercus</i> mixed forests. This species mostly follow cross pollination on the basis of colorful corolla and presence of nectaries.
Threat status	Critically Endangered (CR) in West Bengal.
Description	It is an erect annual herb up to 1.2 m tall. Stems are profusely branching and cylindrical in lower and middle parts; leaves are simple broadly lance shaped about 10 cm long 3 cm broad, 5 nerved. Flowers are greenish yellow tinged with purple, borne on large panicle inflorescences; fruits are capsules, egg shape with many seeds.
Flowering and fruiting	Flowering August to September; Fruiting October to December
Uses	Used in chronic fever , malaria, anemia, bronchial asthma , hepatotoxic disorders, liver disorders, hepatitis, gastritis, blood purification and diabetes are among the many medicinal uses. <i>Swertia chirayita</i> is also used as anthelmintic, laxative, skin ailments and as hypoglycemic. Used to treat colds, cough, inflammation and dyspepsia.
Trade information	This is one of the highly traded medicinal plants having a domestic consumption by the pharmaceutical industries of around 400-700 MT per year.
Propagation and cultivation	Propagated with seeds.

Allium wallichii Kunth



Common Name	Jimbur ,Himalayan Onion , Doona, Gobka, Laddu, Ladu , Ban Lasun, Ksirapalandu
Family	Alliaceae
Habitat and Distribution	<i>Allium wallichii</i> is a plant species native to India, Nepal, Sikkim, Bhutan, Myanmar, and parts of China. It grows at elevations of 2300–4800 m.
Ecology:	The plant is pollinated by insects.
Threat status	Not Evaluated (NE)
Description	It is a perennial herb with numerous purple flower, borne in a lax rounded umbel 5-7 cm across, on top of a leafless 3-angled flowering-stem, 1-3 ft. Petals are broadly linear blunt, spreading in a star, at length reflexed, longer than the purple stamens and ovary. Leaves are many, spear-shaped, flat and keeled, up to 2 cm broad, often almost as long as the flowering stem. Bulb is solitary or clustered, cylindrical; tunic yellowish brown, fibrous.
Flowering and fruiting	Flowering and fruiting from July to October
Uses	The bulbs, boiled then fried in ghee, are eaten in the treatment of cholera and dysentery. The raw bulb is chewed to treat coughs and colds. It is said that eating the bulbs can ease the symptoms of altitude sickness . Members of this genus are in general very healthy additions to the diet. They help reduce blood cholesterol levels, act as a tonic to the digestive system and also tonify the circulatory system. Cooked tender leaves can be used as vegetable. Flowers are used for garnishing salads.
Trade information	Locally traded
Propagation and cultivation	Propagated by seeds

Berberis aristata DC



Common Name	Indian barberry, Daruharidra
Family	Berberidaceae
Habitat and Distribution	<i>B. aristata</i> is found in the temperate and sub-tropical regions of Asia, Europe, and America. It is native to the Himalayas in India and in Nepal. It is also naturally found in the wet zone of Sri Lanka.
Ecology:	<i>B. aristata</i> grows usually in relatively open areas in a community having an association of <i>Daphnae papyraceae</i> , <i>Rubus spp</i> , <i>Rhododendron griffithi</i> , <i>Eurya japonica</i> , <i>Symplocos glomerata</i> , <i>Yushania maling</i> etc,
Threat status	Vulnerable (VU)
Description	This is an erect spiny shrub, ranging between 2 to 3 m in height. It is a woody plant, with bark that appears yellow to brown from the outside and deep yellow from the inside. The bark is covered with three-branched thorns. The leaves are arranged in tufts of five to eight and are approximately 4.9 cm long and 1.8 cm broad; flowers are complete, bisexual, polysepalous, with 3 large and 3 small sepals, and polypetalous, with 6 petals in total and have 6 stamens, 5-6 mm long;; berries are approximately 7 mm long, 4 mm in diameter.
Flowering and fruiting	The flowering starts in mid-March and lasts throughout the month of April.
Uses	The fruits are eaten often as a dessert. The roots are used for making an alcoholic drink. The plant as a whole is a good source of dye and tannin which is used for dyeing clothes and for tanning leather. In India, <i>B. aristata</i> is used.
Trade information	Arround 1000 MT dried roots are consumed in domestic market yearly.
Propagation and cultivation	Propagation by Seeds. In natural conditions, seeds are dispersed by gravitational dispersal mechanism, birds, other animals and by humans.

UTILITY OF THIS PICTORIAL GUIDE

Tonglu MPCA comes under the Darjeeling District which is bestowed with enormous gifts of nature. This whole area falls in the Eastern Himalayan region that makes it an important biodiversity rich zone. This unique ecosystem harbours the most important and magnificent forest having rich gene-pools of many threatened species. It has immense value with respect to various ecosystem services such as climate regulation, carbon sink, soil reclamation, water supply, nutrient cycling, pollination, recreation, aesthetic value and livelihood for many local communities.

This guide booklet will help one to know about the important plants, their global distribution, medicinal uses, issues, related to various threats to these plants and the dependence of local communities on the forest resources such as food, fuelwood, fodder, medicines, honey and many other non-timber forest products (NTFPs).

This book also provides a glimpse of the MPCA in a nutshell. It will allow quick identification of important medicinal plants through their photographs for the field staff from the Forest Department. The list of threatened and less commonly occurring species provides a blue print to the Forest Department for short listing species of conservation concern. The list of traditionally used medicinal plants can promote the sharing of traditional medicinal knowledge among the younger generation of residents neighbouring the MPCA, as well as for researchers, foresters, traders and others. The list of dominant tree species according to their Importance Value Index (IVI) gives a fair idea of the structure and composition of the community and tree species in the MPCA. Finally, this guide book can create awareness regarding the importance of MPCA and facilitate in informed Biodiversity Conservation action programs of West Bengal.

Published in 2022

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Published by
Research Department, Directorate of Forests
Government of West Bengal
Research & Compilation by
ITSCEED, Kolkata