CHAPTER 3

STUDY AREA

3.1. Location

The Chirang Reserve Forest is one of the oldest reserve forests, falls under Haltugaon and Chirang Forest Division of Kokrajhar and Chirang district. It was constituted in accordance with Act VII of 1865 on November 20, 1875 by the government of Assam. It is an integral part of Manas Biosphere Reserve (Hajra and Baishya 2002). It is currently a part of the Bodoland Territorial Region (BTR), which is administered by the government of Bodoland Territorial Council and the government of Assam. The BTR, created on January 27, 2020, consists of the four districts—Kokrajhar, Chirang, Baksa, and Udalguri, which together cover a total area of 9,688 sq. kms. The total forest covered area is 2,811 sq. kms. which is about 29.02 % of total area of BTR. Out of 2,811 sq. kms., VDF occupied 1004 sq. kms., MDF occupied 588 sq. kms. and OF occupied 1219 sq. kms. (FSI 2017). The region includes 43 Reserve Forests including one Elephant Reserve (Chirang-Ripu), two Wildlife Sanctuary (Barnadi WLS and Chakrashila WLS), one Tiger Reserve (Manas TR), three National Parks (Manas NP, Orang NP and Raimona NP), one World Heritage Site (Manas), and one Biosphere Reserve (Manas BR).

The Chirang Reserve Forest is bordered on the west by the Saralbhanga River, on the east by the Bhur River in the upper region and the Chapamati River in the lower plains, on the north by an international border with the Bhutan, and on the south by Kokrajhar Town. It falls between 26°29'33.98"N–26°54'21.95"N latitude and 90°14'01.14"E– 90°25'21.62"E longitude (Figure 1). The total area of reserve forest is 592.54 sq. kms., of which Haltugaon Forest Division of Kokrajhar district occupy 462.87 sq. kms. and Chirang Forest Division of Chirang district occupy 129.67 sq. kms. It consists of three Forest Ranges—Gaurang Range, Jharbari Range, and Ultapani Range. This reserve forest consists of 25 numbers of recognized forest villages. Of these, 20 villages falls under Haltugaon Forest Division of Kokrajhar district and 5 falls under Chirang Forest Division of Chirang District. The names of the forest villages are given in Table 3.

The presence of mangrove like vegetation and swampy types of forest in the stream bank of ‘Naa Bhandhar’ (Mach Bhandhar) under Ultapani Forest Range is the most fascinating and distinctive feature of the forest (Plate 1A and 1B). This area is known as the hub of orchid diversity in the BTR and is home to many threatened orchid species. This forest range also contains a historical site called "Nou Nwgwr," an anciently ruled Bodo kingdom of the Shiknajhar forest, which is regarded as a sacred forest by the Bodo people of Assam.

3.2. Approach

The Chirang Reserve Forest is located about 30 kms. to the north of Kokrajhar town and about 220 kms. to the west of Guwahati, the capital city of Assam. Presence of Indian National Highway No. 31, the North East Frontier Railway station named Kokrajhar Railway Station (Koj), and the Rupshi Airport (about 100 km away), makes the area is easily accessible from any location of the world. The Rupshi Airport, the state's seventh airport, officially inaugurated on May 8, 2021.

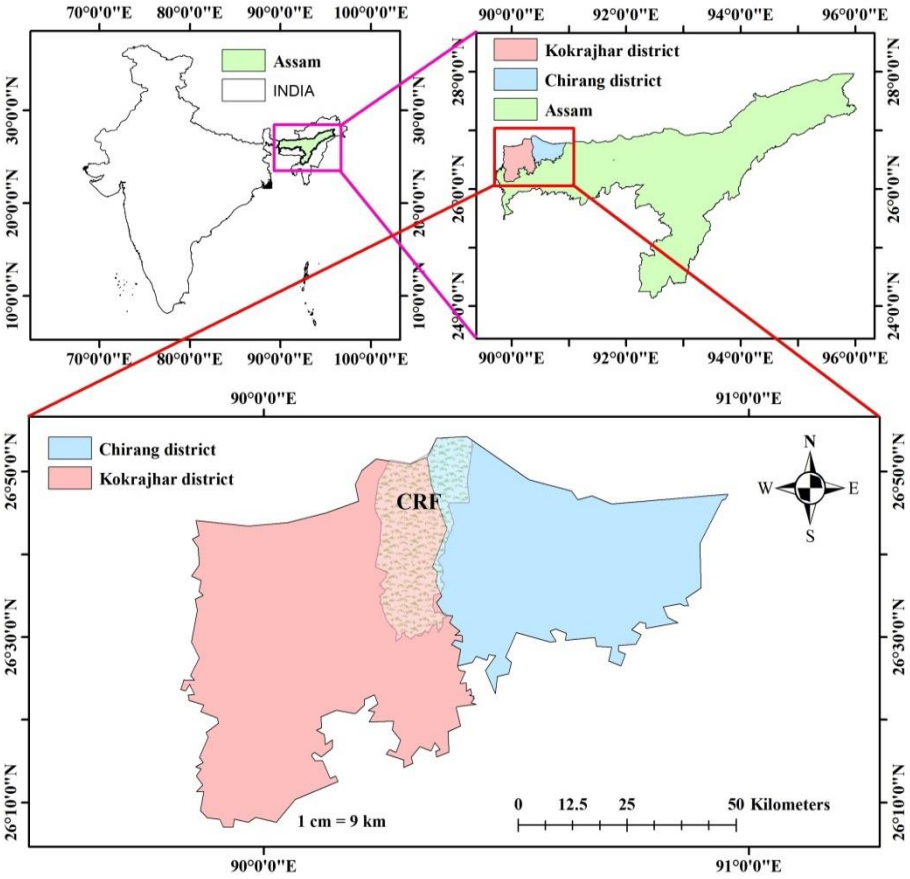

Figure 1. Map showing the location of Chirang Reserve Forest (CRF).

Table 3. Names of forest villages (FV) in CRF

Sl. Nos.	Forest Divisions	Reserve Forest	Forest Ranges	Forest Villages (FV)
1	Haltugaon Forest Division, Kokrajhar	Chirang Reserve Forest	Gaurang Range	Haltugaon FV
2				Bhomoraguri FV
3				Dholjhora FV
4				Ouguri FV
5				Syamshingkilla FV
6				Bishmuri FV
7				Bashbari FV
8				Bhadranpur FV
9				North Maligaon
10				East Maligaon FV
11				West Maligaon FV
12				Bhumka FV
13				Mohanpur FV
14			Jharbari Range	East Mahendrapur FV
15				West Mahendrapur FV
16				Khalasi FV
17				Khashiguri FV
18			Ultapani Range	Labanyapur FV
19				Saralpara FV
20				Ultapani FV
21	Chirang Forest Division, Chirang		-	Aminpara
22				Dakhingaon
23				Khungring
24				Hatidhura
25				Bhur

3.3. Geology and soil

Geologically, the Chirang Reserve Forest is of Pre-Cambrian origin and is coated in alluvium, which is made up of gravel, sand, silt, and clay (Bhattacharjee *et al*. 2014). The soil formation is unmistakably alluvial because alluvium formations are readily visible to the north in Bhutan's foothills, where micaceous sand and clay soils are frequently observed. Some areas of the region are composed of water-borne quartzose and schistose pebbles, which are covered in a coating of sandy loam soil and humus. Sandy to loamy textured red soil can be found in the central plains of the Ultapani Forest Range. The area remains dry for most part of the year except the months of June–September. Silt and clay are the predominant soil types in the lower southern part of the region, which improve moisture retention and raise the level of ground water. Based on elevation, the area can be divided into three distinct physiographic zones.

i. **Highlands:** The elevation in this area ranges from 300m–400m above mean sea level. Northern part of the reserve forest just below the foothills of Bhutan forms the highlands which is the source of many rivers and streams.

ii. **Middle plains:** The elevation in this area ranges from 150m–300m above mean sea level. The entire Ultapani Range and the upper part of the Jharbari Range falls under middle plains and the forest type of this zone represented by Semi-evergreen, moist deciduous or dry deciduous with moderately dense to very dense forest. This zone represents the high richness of the biological diversity out of the entire Chirang Reserve Forest.

iii. **Flood plains:** The elevation in this area ranges from 60m–150m above mean sea level. The area of Gaurang Range and the southern part of Jharbari Range falls under this zone. This region currently has no remaining forest cover because it is entirely populated by people.

3.4. Vegetation

Floristic composition plays significant roles in formation of different patterns of the vegetation. Based on the habitat, different plant species adapted to that habitat for their growth and development. This creates different vegetation types such as forests, deserts, grasslands, and wetlands. Vegetation can vary greatly depending on the climate, soil, and others factors of a particular area. Based on the different habitat types and floral composition, Chirang Reserve Forest can be divided into following classes.

1. Semi-evergreen forest: It is the forests consisting of dominantly evergreen plant species along with the deciduous or semi-deciduous plants. This type of forest found mainly in Ultapani area and parts of the foothills of Bhutan (Plate 2A). The stratification of forest with shrub, lianas, medium size trees as middle storey and large tall trees along with some undergrowth species at floors can also be seen in this type of forests. Those forests generally seen well established and true climax type. But heavy illegal felling of trees drastically changed this climax forest. The tree species found in this type of forests are *Knema tenuinervia*, *Magnolia champaca*, *M. hodgsonii*, *Monoon simiarum*, *Actinodaphne obovata*, *Litsea cubeba*, *L. meghalayensis*, *Phoebe bottanica*, *Dillenia indica*, *Artocarpus chama*, *Ficus auriculata*, *Dendrocnide meyeniana*, *Castanopsis indica*, *Engelhardia spicata*, *Tetrameles nudiflora*, *Euonymus attenuatus*, *Elaeocarpus stapfianus*, *E. varunua*, *Sloanea sterculiacea* var. *assamica*, *Carallia brachiata*, *Garcinia assamica*, *G. pedunculata*, *Calophyllum polyanthum*, *Mesua ferrea*, *Gynocardia odorata*, *Claoxylon longifolium*, *Excoecaria oppositifolia*, *Macaranga indica*, *Terminalia myriocarpa*, *Duabanga grandiflora*, *Memecylon cerasiforme*, *Dalrympelea pomifera*, *Syzygium formosum*, *S. kurzii*, *S. oblatum*, *Syzygium praecox*, *Mangifera sylvatica*, *Aesculus assamica*, *Acronychia pedunculata*, *Picrasma javanica*, *Aglaia chittagona*, *A. spectabilis*, *Aphanamixis polystachya*, *Chisocheton cumingianus* subsp. *balansae*, *Didymocheton mollissimus*, *Dysoxylum gotadhora*, *Pterygota alata*, *Pterospermum lanceifolium*, *Ternstroemia gymnanthera*, *Schima wallichii*, *Callicarpa arborea*, *Ilex odorata*, etc.

The herbs, shrubs small size trees and climbers found in these forests are *Kadsura heteroclita, Piper peepuloides, P. pedicellatum, Aristolochia assamica, A. saccata, Miliusa dioeca, Chloranthus elatior, Homalomena aromatica, Dioscorea oppositifolia, Tacca integrifolia, Smilax bockii, S. orthoptera, Curculigo capitulata, Asparagus racemosus, Dracaena angustifolia, Peliosanthes bipiniana, P. macrophylla, Calamus melanochaetes, Pinanga gracilis, Wallichia oblongifolia, Phrynium pubinerve, Schumannianthus benthamianus, Alpinia roxburghii, Boesenbergia hamiltonii, Globba multiflora, G. orixensis, Hedychium coccineum, H. thyrsiforme, Cyclea peltata, Diploclisia glaucescens, Parabaena sagittata, Pycnarrhena pleniflora, Sabia lanceolata, S. limoniacea, Tetracera sarmentosa, Leea compactiflora, Tetrastigma leucostaphylum, Rubus hexagynus, Ziziphus apetala, Ficus curtipes, F. elastic, F. sagittata, Dendrocnide sinuata, Euonymus vagans, Microtropis discolour, Salacia salacioides, Connarus paniculatus, Alchornea tiliifolia, Croton joufra, Mallotus roxburghianus, Trigonostemon semperflorens, Antidesma montanum, A. roxburghii, Baccaurea ramiflora, Breynia androgyna, B. macrantha, B. trinervia, Glochidion lanceolarium, G. zeylanicum* var. *arborescens*, *G. zeylanicum* var. *tomentosum, Phyllanthus leschenaultia, Medinilla rubicunda, Lepisanthes senegalensis, Micromelum integerrimum, Murraya paniculata, Zanthoxylum asiaticum, Z. rhetsa, Ayenia grandifolia, Vatica lanceifolia, Stixis suaveolens, Capparis assamica, C. olacifolia, Adinandra griffithii, Eurya acuminata, Ardisia thyrsiflora, Myrsine capitellata, Styrax serrulatus, Saurauia armata, Agapetes bhutanica, A. macrantha* var. *grandiflora*, *Chassalia curviflora, Geophila repens, Ixora goalparensis, Lasianthus sikkimensis, Mycetia nutans, Pavetta subcapitata, Polyura geminata, Psychotria calocarpa, P. denticulata, Uncaria sessilifructus, Fagraea ceilanica, Chonemorpha fragrans, Hoya globulosa, H. oreogena, H. verticillata, Rauvolfia verticillata, Ehretia aspera, Lycianthes neesiana, Jasminum flexile, Jasminum subglandulosum, Myxopyrum smilacifolium, Aeschynanthus acuminatus, A. gracilis, Rhynchotechum ellipticum, Acanthus leucostachyus, Codonacanthus pauciflorus, Eranthemum griffithii, Phlogacanthus thyrsiformis, Strobilanthes anisophylla, S. hamiltoniana, S. sabineana, S. simonsii, Callicarpa longifolia, Clerodendrum bracteatum, C. hastatum, C. laevifolium, Gomphostemma ovatum, G. parviflorum, Heptapleurum venulosum,* etc.

The Orchids found in these forests are *Acampe ochracea, Apostasia wallichii, Arundina graminifolia, Bulbophyllum gracilipes, B. odoratissimum, B. parviflorum, B. protractum, B. roxburghii, B. tenuifolium, Calanthe densiflora, C. longipes, C. sylvatica, C. tankervilleae,*

Callostylis rigida, *Chrysoglossum ornatum*, *Cleisocentron pallens*, *Cleisostoma subulatum*, *Coelogyne articulate*, *C. flaccida*, *C. imbricata*, *Corymborkis veratrifolia*, *Cryptochilus acuminatus*, *C. strictus*, *Dendrobium aduncum*, *D. anceps*, *D. farmer*, *D. formosum*, *D. nobile*, *D. ruckeri*, *D. salaccense*, *D. terminale*, *Gastrochilus obliquus var. obliquus*, *G. obliquus* var. *suavis*, *Goodyera procera*, *Hetaeria affinis*, *Liparis mannii*, *Luisia brachystachys*, *L. filiformis*, *Micropera rostrata*, *Mycaranthes floribunda*, *Phalaenopsis lobbii*, *P. mannii*, *Pinalia acervata*, *P. bractescens*, *P. connata*, *Pomatocalpa armigerum*, *Robiquetia spathulata*, *Stereochilus histus*, *Strongyleria pannea*, *Tainia latifolia*, *Thelasis longifolia*, *Thrixspermum centipeda*, *Trichotosia pulvinata*, *Vrydagzynea viridiflora*, *Zeuxine affinis*, etc.

2. Moist deciduous forest: This type of forest occurs in Diglipara area under Gaurang Range, Jharbari area under Jharbari Range and some parts of the Ultapani Range (Plate 2B). The plant species compositions are mixed with deciduous trees along with semi-evergreen trees. Well grown shrubby plants and climbers can also be seen in this type of forests. In the patches of open places, dominated ferns can also be found. The dominant tree species are *Magnolia hodgsonii*, *Actinodaphne obovata*, *Litsea cubeba*, *L. glutinosa*, *L. monopetala*, *Cryptocarya amygdalina*, *Meliosma simplicifolia*, *Dillenia indica*, *Oreocnide integrifolia*, *Lithocarpus dealbatus*, *Elaeocarpus rugosus*, *E. varunua*, *Sloanea sterculiacea* var. *assamica*, *Carallia brachiata*, *Antidesma bunius*, *Baccaurea ramiflora*, *Bischofia javanica*, *Terminalia myriocarpa*, *Syzygium oblatum*, *S. praecox*, *Dalrympelea pomifera*, *Aphanamixis polystachya*, *Dysoxylum gotadhora*, *Sterculia lanceolata* var. *coccinea*, *Shorea robusta*, *Crateva magna*, *Alangium chinense*, *Stereospermum chelonoides*, etc.

The herbs, shrubs small size trees and climbers species are *Aristolochia saccata*, *Chloranthus elatior*, *Dioscorea oppositifolia*, *Smilax perfoliala*, *Crinum amoenum*, *Calamus tenuis*, *Schumannianthus benthamianus*, *Stephania glandulifera*, *S. japonica*, *Tetracera sarmentosa*, *Gouania leptostachya*, *Allaeanthus kurzii*, *Ficus curtipes*, *Dendrocnide sinuata*, *Poikilospermum suaveolens*, *Searia vareca*, *Breynia androgyna*, *Combretum acuminatum*, *Pegia nitida*, *Aesculus assamica*, *Lepisanthes senegalensis*, *Micromelum integerrimum*, *Ayenia grandifolia*, *Vatica lanceifolia*, *Maesa indica*, *Maesa paniculata*, *Schima wallichii*, *Coffea benghalensis*, *Ixora goalparensis*, *Uncaria sessilifructus*, *Beaumontia grandiflora*, *Hoya verticillata*, *Melodimus cochinchinensis*, *Thunbergia grandiflora*, *Clerodendrum bracteatum*, *Viburnum colebrookianum*, etc.

The Orchids species are *Acampe praemorsa* var. *praemorsa*, *A. praemorsa* var. *longepedunculata*, *Aerides multiflora*, *A. odorata*, *Ania penangiana*, *Bulbophyllum crassipes*, *Cymbidium aloifolium*, *Dendrobium aphyllum*, *Dendrolirium lasiopetalum*, *Oberonia mucronata*, *Papilionanthe teres*, *Rhynchostylis retusa*, etc.

3. Dry deciduous forest: This forest comprises dominantly with deciduous trees. Here the loose diversity of shrubs can be seen and herbaceous flora too. During winter, maximum plants' leaves fall off and seen leafless and transparent throughout the forests. The middle part of the CRF, the Ride No. 5 area under Jharbari and Gaurang Range shows this type of forests (Plate 3A and 3B). Dominant tree species are *Dillenia pentagyna*, *Sterculia villosa*, *Terminalia bellirica*, *Lagerstroemia parviflora*, *Litsea monopetala*, *Artocarpus lacucha*, *Bombax ceiba*, *Careya arborea*, *Firmiana colorata*, *Pterospermum acerifolium*, *Mallotus philippensis*, *Spondias pinnata*, *Toona ciliata*, *Oroxylum indicum*, *Stereospermum chelonoides*, *Callicarpa arborea*, *Crateva magna*, *Trema orientale*, *Alstonia scholaris*, *Holarrhena pubescens*, *Wrightia arborea*, etc.

Some of the undergrowth species are *Smilax perfoliala*, *Crinum amoenum*, *Hellenia speciosa*, *Curcuma aromatica*, *Dalbergia volubilis*, *Mezoneuron cucullatum*, *Millettia extensa*, *Rubus rugosus*, *Allaeanthus kurzii*, *Croton caudatus*, *Phyllanthus reticulatus*, *P. sikkimensis*, *Lannea coromandelica*, *Sida acuta*, *Urena lobata*, *Alangium chinense*, *Ardisia solanacea*, *Coffea benghalensis*, *Morinda angustifolia*, *Thunbergia grandiflora*, *Lantana camara*, *Holmskioldia sanguinea*, etc.

The dominant Orchids species are *Acampe praemorsa* var. *praemorsa*, *A. praemorsa* var. *longepedunculata*, *Aerides odorata*, *Bulbophyllum crassipes*, *Chiloschista parishii*, *Coelogyne imbricata*, *Cymbidium aloifolium*, *Dendrobium aphyllum*, *D. fimbriatum*, *D. fugax*, *D. jenkinsii*, *D. moschatum*, *D. transparens*, *Dendrolirium lasiopetalum*, *Gastrochilus inconspicuus*, *Luisia trichorhiza*, *Oberonia mucronata*, *Papilionanthe teres*, *Phalaenopsis deliciosa*, *Pinalia acervata*, *Rhynchostylis retusa*, etc.

4. Riparian forest: This type of forest occurs in river banks of Saralbhanga, Laopani, Dholpani, and Bhur (Plate 4A and 4B). The plant species found in this type of forests are *Bauhinia purpurea*, *Croton caudatus*, *Dalbergia sissoo*, *Duabanga grandiglora*, *Senegalia catechu*, *Mallotus nudiflorus*, *M. tetracoccus*, *Trema orientale*, *Woodfordia fruticosa*, *Tamarix dioica*, *Buddleja asiatica*, *Saccharum spontaneum*, *Imperata cylindrica* etc.

5. Degraded or scrub forest: This type of forests occurs in forests margins in all human inhabitant area. This type of forests meets high grazing pressure and the anthropogenic activities. Many parts of healthy forests degraded due to the pressure of various human activities. The plant species in these forests are *Mallotus nudiflorus, Mallotus tetracoccus, Aporosa octandra, Bridelia stipularis, Bridelia tomentosa, Litsea salicifolia, Trema orientale, Ficus triloba, Macaranga denticulata, Melastoma malabathricum, Abroma augustum, Grewia serrulata, Smilax perfoliala, Hellenia speciosa, Alpinia nigra, Curcuma aromatica, Senna alata, Senna occidentalis, Flueggea virosa, Glochidion multiloculare, Ardisia solanacea, Symplocos acuminata, Pavetta indica, Solanum torvum, Clerodendrum infortunatum, Chromolaena odorata,* etc.

2.5. Demography

The inhabitants of the area are the tribes of Bodo, Nepali, Santhal, and Rajbongshi. Among these, Bodos are the oldest and dominant inhabitant. As per the census 2011, the total population of the area is 16,359 of 1,235 households where Gaurang Range with 10, 595 individuals of 538 households, Jharbari Range with 1,819 individuals of 251 households and Ultapani Range with 3,900 individuals of 446 households (Baruah *et al*. 2016).

Plate 1

Streams inside forest: A. Naa Bhandhar (Mach Bhandhar); **B.** Samokha.

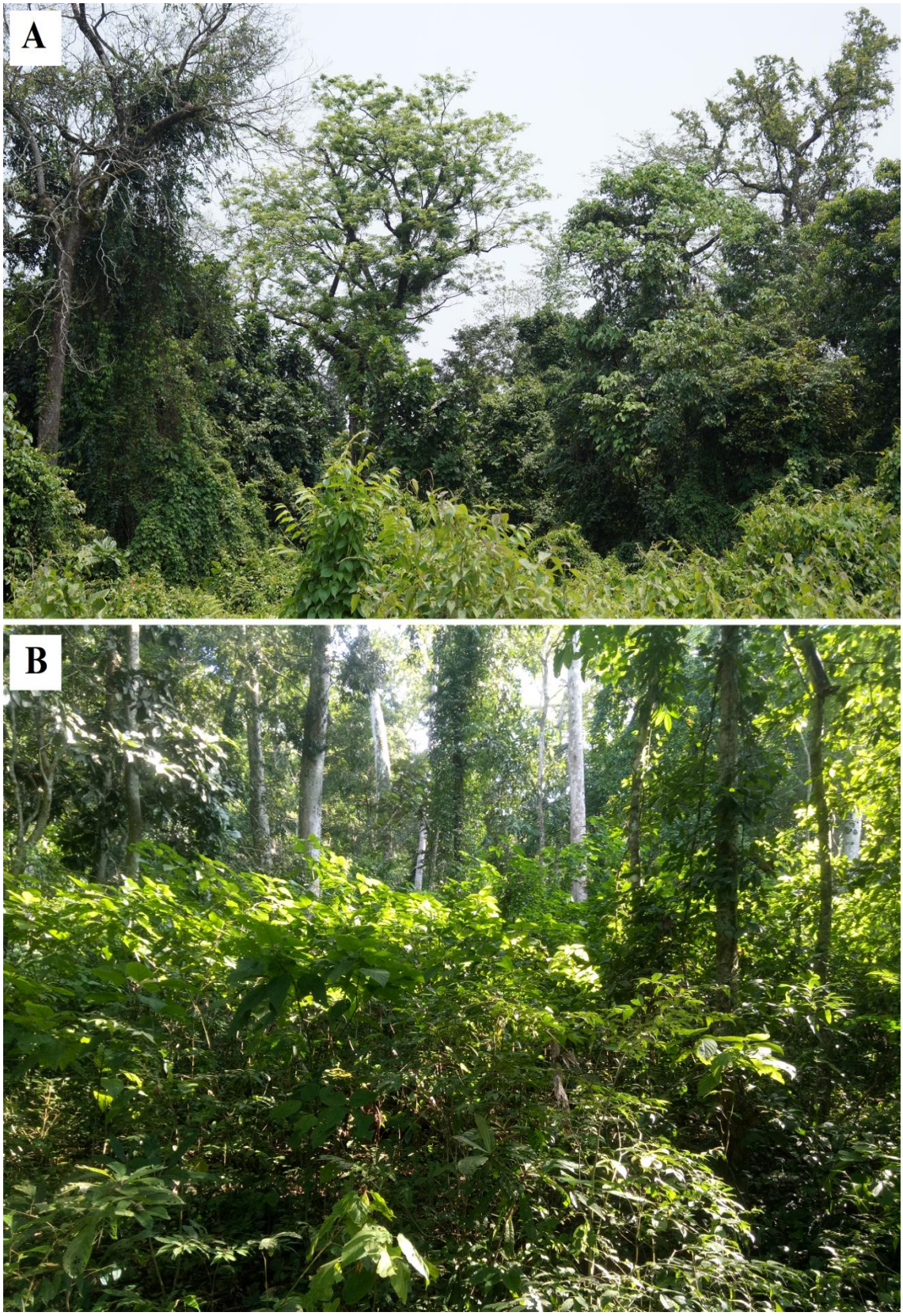

Plate 2

Forest types: A. Moist deciduous forest; **B.** Semi-evergreen forest.

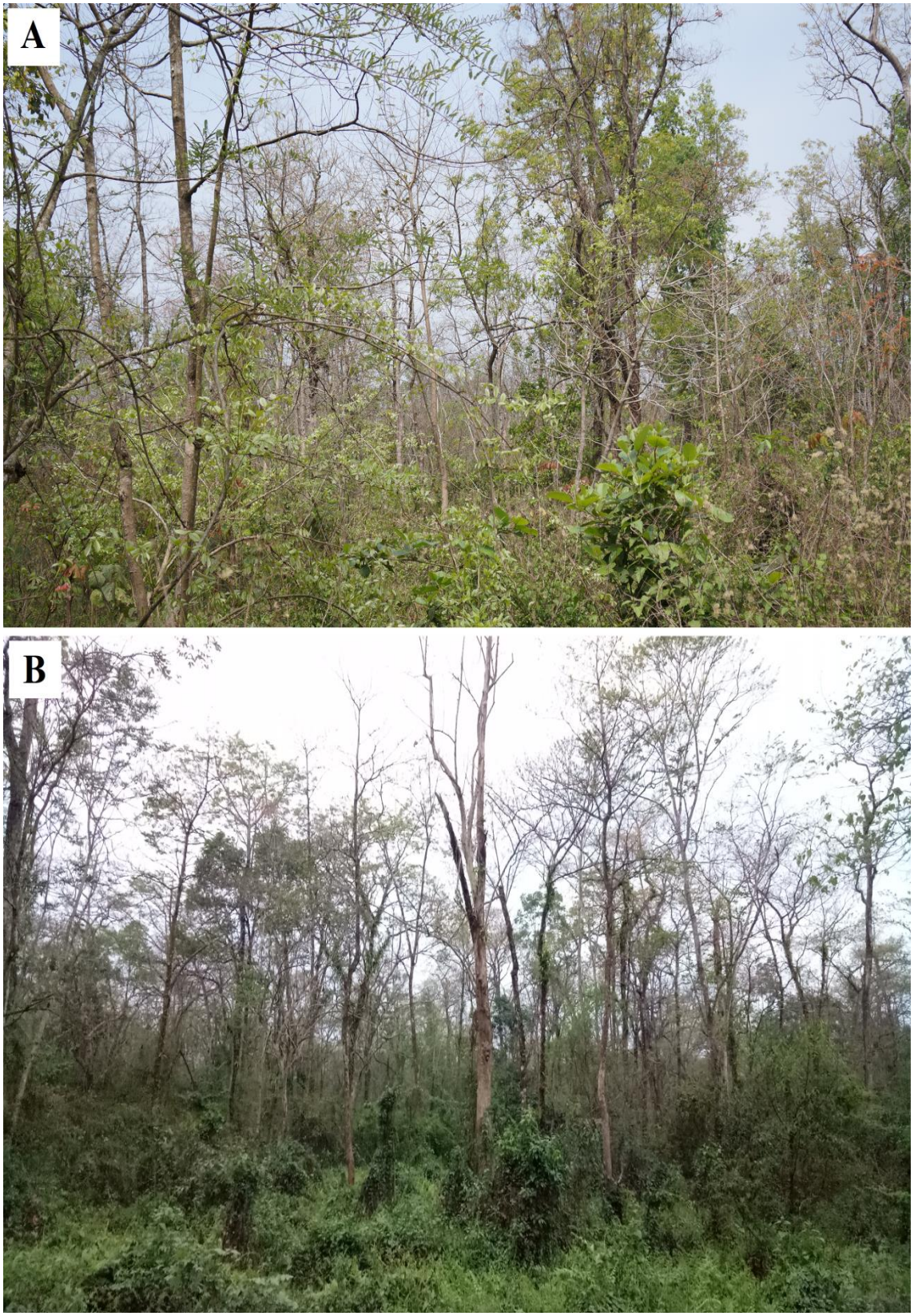

Plate 3

A and **B:** Deciduous forest.

Plate 4

A and **B:** Riparian forest.