

## CHAPTER 4

# ENVIRONMENTAL BASELINE STATUS: ECOLOGICAL ASPECTS

### 4.1 TERRESTRIAL ECOLOGY

#### 4.1.1 Forest Types

The catchment area which has an altitudinal range from 300 m to 5400 m has a very interesting floristic composition representing changes in forest types, typical of the Eastern Himalayas with the change in altitude. The favourable rainfall, temperature and high humidity have caused the vegetation to acquire the general characteristics of the Northern Tropical Semi- Evergreen & North Indian Moist Deciduous Forests.

##### 4.1.1.1 Assam Valley & Eastern Sub-montane Semi-evergreen Forests (2B/C1a and 2B/C1b)

These forests cover the foot hills and extend up to 1000 m altitude. The climatic conditions and high humidity make the area highly suitable for luxuriant growth of vegetation and many trees attain magnificent growth in height and diameter. The forests are of mixed broad –leaved type.

Top storey of the forest comprises *Ailanthus grandis*, *Altingia excelsa*, *Amoora wallichii*, *Artocarpus chaplsa*, *Canarium resiniferum*, *Castanopsis indica*, *Chukrasia tabularis*, *Duabanga grandiflora*, *Syzygium cumini*, *Gmelina arborea*, *Magnolia* spp., *Mesua ferrea*, *Morus laevigata*, *Phoebe cooperiana*, *Pterospermum acerifolium*, *Sterculia villosa*, *Stereospermum celonoides*, *Talauma hodgsonii*, *Terminalia myriocarpa*, *T. belerica*, *Tetrameles nudiflora*, *Toona ciliata* etc.

Middle storey comprises of *Dillenia indica*, *Dysoxylum binnectariferum*, *Gynocardia odorata*, *Larix griffithiana*, *Macaranga denticulata*, *Michelia acer*, *Quercus lamellosa*, *Q. fenestrata*, *Q. griffithii*, *Q. semiserrata*, *Rhododendron* spp. etc. Several species of canes viz. *Calamus erectus*, *C. flagellum*, *C. floribundus*, *C. tenuis* etc. occur in these forests. *Caryota* spp. also occurs in

these forests. Tree fern *Alsophila* sp. is quite common everywhere. *Musa balbisiana* (wild banana) occurs in gregarious patches on hill slopes.

However, interspersed with this thick vegetation, there are occasional patches of open forests presumably created as a result of past jhuming. Such types of forests are generally covered with bamboos, canes and shrubs dotted with scattered trees giving the appearance of 'scrub forest'. Grasses like *Imperata arundinacea*, *Saccharum spontaneum*, *Phragmites karka* and *ravennea* with trees like *Dillenia indica*, *Erythrina suberosa*, *Bischofia javanica* and *Kydia calycina* predominate in this formation. There are also stretches of bamboo forests consisting mainly of *Bambusa pallida*, *Dendrocalamus hamiltonii* and occasionally *Pseudostachyum polymorphum*.

Jhum lands are generally abandoned after 3 to 5 years and such lands are generally invaded by *Trema orientalis*, *Macaranga peltata*, *Mallotus* sp., canes and bamboos (mainly *P. polymorphum*).

#### **4.1.1.2 Subtropical Moist Deciduous Forests**

This type occurs generally in a limited area of the middle hills between El 1000 m and 1500 m or slightly higher. The vegetation is very typical of this altitude and consists of a few selected species like *Schima wallichii*, *Callicarpa arborea*, *Macaranga* spp., *Castanopsis indica*, *Magnolia pterocarpa*, *Engelhardtia spicata*, *Actinodaphne ovata*, *Ostodes paniculata*, *Ficus gasperiniana*, *Bauhinia variegata* and *Bucklandia populnea* at higher elevations. *Musa balbisiana* is very common in the lower zone. The vegetation is very dense and the undergrowth is profuse. Several species of bamboos like *Cephalostachyum latifolium*, *Phyllostachys bambusoides* and *Chinobambusa callosa* are common in this type with grasses such as *Arundinella bengalensis*, *Saccharum arundinaceum*, *Setaria palmifolia* and *Thysanolaena maxima*.

#### **4.1.1.3 East Himalayan Subtropical Wet Temperate Forests (8B/C1)**

In the temperate zone between El 1500 m and 2500 m, the forests are characterised by prevalence of *Quercus* and *Castanopsis* spp. These forests are not as dense as the previous ones but when well protected, will provide good ground cover. The important tree species representing this type are

*Quercus griffithii*, *Castanopsis* spp., *Alnus nepalensis*, *Engelhardtia spicata*, *Bucklandia populnea*, *Cornus controversa*, *Acer* sp., *Michelia cathcartii*, *M. excelsa*, *Betula alnoides*, *Magnolia* spp., *Prunus* spp., *Pyrus* spp., *Macaranga* spp., *Nyssa javanica*, *Eriobotrya petiolata* and *Rhododendron* spp. Rhododendrons give bright hue to these forests in the advent of spring. In the undergrowth *Colebrookea* spp., *Berberis wallichii*, *Osbeckia* spp. and *Lycopodium* spp. and various other flowering herbs predominate. Several conifers like *Abies spectabilis*, *Cupressus torulosa*, *Taxus baccata* and *Tsuga dumosa* occur sporadically, but pines are absent from this area.

#### **4.1.1.4 Subalpine or Temperate Montane Forests**

Between EL 2500 m and 3000 m, the forests go through a transitory stage and this catchment has a fairly large area between EL 3000 m and 5500 m representing the sub-alpine and alpine vegetation. Conifers like *Abies* sp (Silver Fir), *Tsuga dumosa* (Hemlock), *Pinus wallichiana* (Blue Pine), *Taxus baccata* (Speria Fir) and *Larix griffithiana* occur in the forests.

The under storey consists of a dense bushy zone of *Rhododendron* spp., *Juniperus recurva*, *Berberis* spp., *Salix* spp., *Crotoneaster* spp. and some other herbaceous species, particularly of the families Rosaceae and Ranunculaceae, with some Polygonaceae and Gentianaceae here and there. The alpine vegetation is limited to altitudes 4500 m to 5500 m. The vegetation becomes scarce, and the general look is that of coarse meadow. The vegetation consists of stunted gnarled shrubs with deep roots and stunted shoots. *Rhododendron anthopogon* and *R. nivale* are frequent. Species of *Abies*, *Juniperus* and *Berberis* are common. Above the tree line, the vegetation consists of herbaceous Primulas, *Rhus*, *Saxifraga*, *Sedum*, *Saussurea*, *Gentiana* with few *Aconitum*, *Bromus*, *Stipa* and *Festuca*. The alpine and sub-alpine areas are presumably included within the Dibang Wild Life Sanctuary and are expected to receive almost total protection.

The entire catchment area of Dibang River is also very rich in Epiphytic orchids. The dense vegetation, well distributed rainfall and humid conditions encourage the growth of these wonderful plants known for its magnificent and scented flowers the world over. Some of the species are terrestrial in nature.

Even a single tree in the dense forest of this region is a natural orchidarium in itself with many taxa growing on it.

#### **4.1.2 Major Floral Species found in submergence area**

A list of major angiosperms found in area, which is likely to be submerged is given below. All the species have been dealt with under their corresponding families which have been arranged according to Bentham & Hooker's system of classification (1862-1883) except with slight modifications as per recent trends. Further, the genera under a family and species under a genus have been arranged alphabetically. Common name (if any) is given in parenthesis.

#### **RANUNCULACEAE**

*Aconitum ferox* Wallich (*Vulnerable as per BSI Red Data Book*)

*Aconitum lethale* Griff.

*Coptis teeta* Wallich

*Naravelia zeylanica* DC. (Gorap-choi)

*Ranunculus* spp.

#### **DILLENIACEAE**

*Dillenia indica* L.

*Dillenia pentagyna* Roxb.

#### **MAGNOLIACEAE**

*Magnolia hookeri* (Cubitt & Smith) H. J. Chowdhery & P. Daniel

*Magnolia griffithii* Hook. f. & Thomson

*Michelia cathcartii* Hook. f. & Thomson

*Talauma hodgsoni* Hook. f. & Thomson (Baramthuri)

*Talauma phellocarpa* King (Tita sopa)

#### **ANNONACEAE**

*Fissistigma polyanthum* Merr.

#### **BERBERIDACEAE**

*Berberis wallichiana* DC.

#### **BIXACEAE**

*Gynocardia odorata* R. Br. (Dalmugra)

#### **FLACOURTIACEAE**

*Casearia glomerata* Roxb.

**CLUSIACEAE**

*Mesua ferrea* L. (Nahar)

**TERNSTROEMIACEAE**

*Schima wallichii* Choisy. (Makrisal)

**MALVACEAE**

*Abelmoschus esculentus* Moench.

*Abelmoschus moschatus* Medik.

*Kydia calycina* Roxb. (Pichola)

**BOMBACACEAE**

*Bombax ceiba* L. (Simul)

**STERCULIACEAE**

*Abroma augusta* L. f.

*Mansonia dipikae* Purkay. (Badam)

*Pterospermum acerifolium* (L.) Willd. (Hatipolia)

*Sterculia villosa* Roxb. ex Sm. (Udal)

**ELAEOCARPACEAE**

*Elaeocarpus grandifolius* Kurz

**BLASAMINACEAE**

*Impatiens* sp.

**RUTACEAE**

*Eudodia trichotoma* (Lour.) Pierre

**SIMAROUBACEAE**

*Ailanthus grandis* Prain (Borpat)

**BURSERACEAE**

*Canarium bengalense* Roxb. (Dhuna)

**MELIACEAE**

*Amoora wallichii* King (Amari)

*Azadirachta indica* A. Juss. (Neem)

*Chukrasia tabularis* A. Juss. (Bogipoma)

*Dysoxylum binectariferum* Hook. f. ex Bedd. (Banderdima)

*Melia azedarach* L. (Gohra neem)

*Toona ciliata* M. Roem. (Poma)

**RHAMNACEAE**

*Rhamnus nipalensis* M. Laws.

**ACERACEAE**

*Acer acuminatum* Wallich ex D. Don

**ANACARDIACEAE**

*Rhus semialata* Murr.

**FABACEAE**

*Desmodium* sp.

*Erythrina suberosa* Roxb.

**CAESALPINIACEAE**

*Acrocarpus fraxinifolius* Wight & Arnott (Mundani)

*Albizia lebbeck* (L.) Benth. (Siris)

*Albizia lucida* Benth. (Moj)

*Bauhinia variegata* L.

*Delonix regia* (Bojer ex Hook.) Rafin. (Gulmohar)

**MIMOSACEAE**

*Acacia pennata* Willd.

**ROSACEAE**

*Cotoneaster* sp.

*Eriobotrya petiolata* Hook. f.

*Prunus* sp.

*Pyrus* sp.

*Rubus moluccanus* L.

**SAXIFRAGACEAE**

*Saxifraga aristulata* Hook. f. & Thomson.

**CRASSULACEAE**

*Sedum* spp.

**HAMAMELIDACEAE**

*Altingia excelsa* Noronha (Jutuli)

*Bucklandia populnea* R. Br. (Pipli)

**COMBRETACEAE**

*Combretum decandrum* Roxb.

*Terminalia arjuna* Wight & Arnott (Arjun)

*Terminalia bellerica* (Gaertn.) Roxb. (Bahera)

*Terminalia myriocarpa* Heurck & Muell. Arg. (Hollock)

**MYRTACEAE**

*Eucalyptus citridora* Hook.

*Syzygium cumini* (L.) Skeels (Jamuk)

**MELASTOMACEAE**

*Anplectrum assamicum* C. B. Clarke

*Melastoma malabathricum* L. (Phutuka)

*Osbeckia japonica* Naud.

*Osbeckia stellata* Wallich

**LYTHRACEAE**

*Cuphea* sp.

*Duabanga grandiflora* Walp. (Khokun)

**BEGONIACEAE**

*Begonia* sp.

**DATISCEAE**

*Tetrameles nudiflora* R. Br.L.

**APIACEAE**

*Centella asiatica* (L.) Urban (Manimuni)

**ARALIACEAE**

*Schefflera venulosa* Harms

**CORNACEAE**

*Cornus controversa* Hemsl.

*Nyssa javanica* Wangerin

**SAMBUCACEAE**

*Sambucus* sp.

**RUBIACEAE**

*Anthocephalus chinensis* (Lam.) A. Rich. ex Walp. (Kadamb)

*Hedyotis* sp.

*Mussaenda roxburghii* Hook. f.

**ASTERACEAE**

*Ageratum conyzoides* L.

*Anaphalis* sp.

*Artemisia maritima* L.

*Artemisia nilagirica* Pampen.

*Bidens bipinnata* L.

*Eupatorium odoratum* L.  
*Gnaphalium canum* Wallich  
*Saussurea* spp.  
*Siegesbeckia orientalis* L.  
*Sphaeranthus paniculatus* Cass.  
*Vernonia volkameriaefolia* DC.

**ERICACEAE**

*Agapetes* spp.  
*Rhododendron arboretum* Sm.  
*Rhododendron calostrotum* Balf. f. & Ward  
*Rhododendron cephalanthum* Franch  
*Rhododendron griffithianum* Wight  
*Rhododendron tephropeplum* Balf. f. & Forrest  
*Vaccinium* spp.

**MYRSINACEAE**

*Maesa indica* Wallich  
*Myrsine* sp.

**EBENACEAE**

*Diospyros variegata* Kurz

**APOCYNACEAE**

*Alstonia scholaris* R. Br. (Satian)

**GENTIANACEAE**

*Gentiana* spp.

**CONVOLVULACEAE**

*Ipomoea fistulosa* Jacq. Subsp. *fistulosa* (Mart. ex Choisy) D. F. Austin

**SOLANACEAE**

*Solanum indicum* L.  
*Solanum torvum* Sw.

**GESNERIACEAE**

*Aeschynanthus acuminata* Wallich  
*Chirita acuminata* R. Br.  
*Rhynchotechum ellipticum* DC.

**BIGNONIACEAE**

*Stereospermum chelonoides* (L. f.) DC. (Paroli)



**ACANTHACEAE**

*Strobilanthes* sp.

**VERBENACEAE**

*Callicarpa arborea* Roxb.

*Clerodendron colebrookianum* Walp.

*Gmelina arborea* Roxb. (Gamari)

**LAMIACEAE**

*Colebrookia* spp.

**POLYGONACEAE**

*Polygonum capitatum* Buch.-Ham. ex D. Don

*Polygonum chinense* L.

*Polygonum microcephalum* D. Don

**PIPERACEAE**

*Piper trioicum* Roxb.

**LAURACEAE**

*Actinodaphne obovata* Blume

*Cinnamomum glaucescens* (Nees) Hand.-Mazz. (Gonsorai)

*Cinnamomum tamala* T. Nees (Tejpat)

*Litsea kurzii* King ex Hook. f.

*Phoebe cooperiana* P. C. Kanj. & Das (Mekahi)

**EUPHORBIACEAE**

*Bischofia javanica* Blume (Urium)

*Glochidion* sp.

*Macaranga denticulata* (Blume) Muell. Arg.

*Macaranga roxburghii* Wight

*Mallotus nepalensis* Muell. Arg.

*Phyllanthus emplica* L.

*Ostodes paniculata* Blume

*Sapium baccatum* Roxb. (Selleng)

**URTICACEAE**

*Elatostema* sp.

*Pouzolzia bennettiana* Wight

*Pouzolzia sanguinea* (Blume) Merr.

*Sarcochlamys pulcherrima* Gaudich.

**ULMACEAE**

*Trema orientalis* (L.) Blume

**MORACEAE**

*Artocarpus chaplasi* Roxb. (Sam)

*Artocarpus lakoocha* Roxb. (Dewasali)

*Ficus gasparriniana* Miq.

*Ficus religiosa* L. (Peepal)

*Ficus semicordata* Buch.-Ham. ex Sm.

*Ficus squamosa* Roxb.

*Morus laevigata* Wallich (Bola)

*Poikilospermum suaveolens* (Blume) Merr.

**JUGLANDACEAE**

*Engelhardtia spicata* Blume

**BETULACEAE**

*Alnus nepalensis* D. Don (Uti)

*Betula alnoides* Buch.-Ham. (Birch)

**FAGACEAE**

*Castanopsis indica* A. DC. (Hingori)

*Quercus fenestrata* Roxb.

*Quercus griffithii* Hook. f. & Thomson ex Miq.

*Quercus lamellosa* Sm.

*Quercus semiserrata* Roxb.

**SALICACEAE**

*Salix* spp.

**ORCHIDACEAE**

*Aerides fieldingii* Lodd. ex E. Morr.

*Aerides multiflorum* Roxb.

*Calanthe masuca* Lindl.

*Coelogyne asperata* Lindl.

*Coelogyne barbata* Lindl. ex Griff.

*Coelogyne mossiae* Rolfe (Vulnerable as per BSI Red Data Book)

*Coelogyne ochracea* Lindl.

*Cymbidium cyperifolium* Wallich

*Cymbidium eberneum* Lindl.

*Cymbidium elegans* Lindl.  
*Cymbidium giganteum* Wallich  
*Cymbidium longifolium* D. Don  
*Dendrobium aurantiacum* Reichb. f. (Endangered as per BSI Red Data Book)  
*Dendrobium crysanthum* Wallich  
*Dendrobium densiflorum* Wallich  
*Dendrobium devonianum* Paxt.  
*Dendrobium falconeri* Hook.  
*Dendrobium hookerianum* Lindl.  
*Dendrobium moschatum* (Buch.-Ham.) Sw.  
*Epipogium indicum* H. J. Chowdhery, G. D. Pal & G. S. Giri  
*Galeola falconeri* Hook. f.  
*Paphiopedilum fairieanum* (Lindl.) Stein (Endangered as per BSI Red Data Book)  
*Paphiopedilum hirsutissimum* Pfitz.  
*Paphiopedilum venustum* Pfitz. (Vulnerable as per BSI Red Data Book)  
*Rhynchostylis retusa* (L.) Blume  
*Vanda coerulea* Griff. ex Lindl. (Rare as per BSI Red Data Book)  
*Vanda teres* Lindl.

#### ZINGIBERACEAE

*Alpinia molucana* Gagnep.  
*Curcuma* sp.  
*Globba clarkei* Baker  
*Globba multiflora* Wallich  
*Hedychium coronarium* J. Koenig  
*Zingiber* sp.

#### COSTACEAE

*Costus speciosa* (J. Koenig) Sm.

#### MARANTACEAE

*Phrunium pubenerve* Blume

#### MUSACEAE

*Musa balbisiana* Colla

#### IRIDACEAE

*Iris* sp.

**TACCACEAE**

*Tacca cristata* Jacq.

**DIOSCOREACEAE**

*Dioscorea globosa* Roxb.

**LILIACEAE**

*Chlorophytum tuberosum* Baker

**COMMELINACEAE**

*Commelina* spp.

**ARECACEAE**

*Calamus erectus* Roxb. (Cane)

*Calamus flagellum* Griff. ex Mart. (Cane)

*Calamus floribundus* Griff. (Cane)

*Calamus ornatus* Blume ex Schult. f. (Cane)

*Calamus tenuis* Roxb. (Cane)

**PANDANACEAE**

*Pandanus odoratissimus* L. f. (Ketki)

**ARACEAE**

*Acorus calamus* L.

*Colocasia* sp.

*Rhaphidophora decursiva* Scott.

**CYPERACEAE**

*Carex baccans* Nees

*Carex cruciata* Wahlenb.

*Cyperus brevifolius* Hassk.

*Pycreus flavidus* (Retz.) T. Koyama

**POACEAE**

*Arundinella bengalensis* (Spreng.) Druce

*Bambusa pallida* Munro (Bamboo)

*Bambusa tulda* Roxb. (Bamboo)

*Bromus* sp.

*Cephalostachyum latifolium* Munro

*Chimonobambusa callosa* Nakai

*Dendrocalamus hamiltonii* Nees & Arnott ex Munro (Bamboo)

*Erianthus ravennae* P. Beauv.

*Festuca* sp.  
*Imperata cylindrica* (L.) Raeuschel.  
*Panicum palmifolium* Poir.  
*Phragmites karka* (Retz.) Trin. ex Steud.  
*Phyllostachys bambusoides* Sieb. & Zucc.  
*Pseudostachyum polymorphum* Munro  
*Saccharum arundinaceum* Retz.  
*Saccharum spontaneum* L.  
*Setaria palmifolia* Stapf  
*Stipa* spp.  
*Thysanolaena maxima* (Roxb.) Kuntze

#### 4.1.3 Major Floral Species found in 7 km radius of reservoir

A list of major angiosperms found in 7 km radius of reservoir is given below. All the species have been dealt with under their corresponding families which have been arranged according to Bentham & Hooker's system of classification (1862-1883) except with slight modifications as per recent trends. Further, the genera under a family and species under a genus have been arranged alphabetically. Common name (if any) is given in parenthesis.

#### RANUNCULACEAE

*Aconitum ferox* Wallich (*Vulnerable as per BSI Red Data Book*)  
*Aconitum lethale* Griff.  
*Clematis gouriana* Roxb. ex DC.  
*Coptis teeta* Wallich  
*Naravelia zeylanica* DC. (*Gorap-choi*)  
*Ranunculus* spp.

#### DILLENIACEAE

*Dillenia indica* L.  
*Dillenia pentagyna* Roxb.

#### MAGNOLIACEAE

*Magnolia hookeri* (Cubitt & Smith) H. J. Chowdhery & P. Daniel  
*Magnolia griffithii* Hook. f. & Thomson  
*Michelia cathcartii* Hook. f. & Thomson

*Talauma hodgsoni* Hook. f. & Thomson (Baramthuri)

*Talauma phellocarpa* King (Tita sopa)

**ANNONACEAE**

*Desmos chinensis* Lour.

*Desmos longiflorus* Safford

*Desmos praecox* Safford

*Fissistigma polyanthum* Merr.

**MENISPERMACEAE**

*Cissampelos pareira* L.

*Cyclea bicristata* Diels

*Diploclisia glaucescens* (Blume) Diels

**BERBERIDACEAE**

*Berberis kashmirana* Ahrendt

*Berberis wallichiana* DC.

**PAPAVERACEAE**

*Corydalis pseudolongipes* M. Lidén

**BRASSICACEAE**

*Brassica rapa* L. subsp. *campestris* (L.) Clapham

*Cardamine hirsuta* L.

**CAPPARACEAE**

*Capparis tenera* Dalzell.

*Crataeva magna* DC.

**VIOLACEAE**

*Viola canescens* Wallich

**BIXACEAE**

*Gynocardia odorata* R. Br. (Dalmugra)

**FLACOURTIACEAE**

*Casearia glomerata* Roxb.

*Casearia vareca* Roxb.

**CARYOPHYLLACEAE**

*Drymaria diandra* Blume

**TAMARICACEAE**

*Tamarix dioica* Roxb.

**CLUSIACEAE**

*Mesua ferrea* L. (Nahar)

**TERNSTROEMIACEAE**

*Schima wallichii* Choisy. (Makrisal)

**THEACEAE**

*Camellia caudata* Wallich

**DIPTEROCARPACEAE**

*Dipterocarpus* sp.

*Shorea robusta* Gaertn. f.

**MALVACEAE**

*Abelmoschus esculentus* Moench.

*Abelmoschus moschatus* Medik.

*Kydia calycina* Roxb. (Pichola)

*Sida acuta* Burm. f.

*Urena lobata* L.

**BOMBACACEAE**

*Bombax ceiba* L. (Simul)

*Bombax insigne* Wallich var. *polystemon* (Indeterminate as per BSI Red Data Book)

**STERCULIACEAE**

*Abroma augusta* L. f.

*Mansonia dipikae* Purkay. (Badam)

*Pterospermum acerifolium* (L.) Willd. (Hatipolia)

*Pterospermum reticulatum* Wight & Arnott (Rare as per BSI Red Data Book)

*Sterculia urens* Roxb.

*Sterculia villosa* Roxb. ex Sm. (Udal)

**ELAEOCARPACEAE**

*Elaeocarpus grandifolius* Kurz

**MALPIGHIACEAE**

*Aspidopterys nutans* Hook. f.

**BLASAMINACEAE**

*Impatiens* sp.

**RUTACEAE**

*Citrus aurantifolia* Swingle

*Citrus limon* (L.) Burm. f.

*Citrus reticulata* Blanco

*Clausena excavata* Burm. f.

*Eudodia trichotoma* (Lour.) Pierre

**SIMAROUBACEAE**

*Ailanthus grandis* Prain (Borpat)

**BURSERACEAE**

*Canarium bengalense* Roxb. (Dhuna)

**MELIACEAE**

*Aglaia edulis* A. Gray

*Aglaia spectabilis* (Miq.) S. S. Jain & S. S. R. bennet

*Amoora wallichii* King (Amari)

*Azadirachta indica* A. Juss. (Neem)

*Chukrasia tabularis* A. Juss. (Bogipoma)

*Dysoxylum binneclariferum* Hook. f. ex Bedd. (Banderdima)

*Melia azedarach* L. (Gohra neem)

*Toona ciliata* M. Roem. (Poma)

**CELASTRACEAE**

*Kurrimia robusta* Kurz ex M. Laws

**RHAMNACEAE**

*Rhamnus nipalensis* M. Laws.

**VITACEAE**

*Cissus assamica* Craib.

*Cissus repens* A. Chevalier

*Vitis heyneana* Roem. & Schult.

**SAPINDACEAE**

*Allophylus serratus* Kurz

**ACERACEAE**

*Acer acuminatum* Wallich ex D. Don

**ANACARDIACEAE**

*Rhus semialata* Murr.

**FABACEAE**

*Crotalaria alata* Buch.-Ham. ex Roxb.

*Dalbergia sissoo* Roxb.



*Desmodium multiflorum* DC.

*Erythrina suberosa* Roxb.

#### CAESALPINIACEAE

*Acrocarpus fraxinifolius* Wight & Arnott (Mundani)

*Albizia lebbeck* (L.) Benth. (Siris)

*Albizia lucida* Benth. (Moj)

*Albizia procera* Benth.

*Bauhinia scandens* L.

*Bauhinia vahlii* Wight & Arnott

*Bauhinia variegata* L.

*Delonix regia* (Bojer ex Hook.) Rafin. (Gulmohar)

#### MIMOSACEAE

*Acacia pennata* Willd.

#### ROSACEAE

*Cotoneaster* sp.

*Eriobotrya petiolata* Hook. f.

*Fragaria indica* Andr.

*Prunus* sp.

*Pyrus* sp.

*Rubus ellipticus* Sm.

*Rubus lucens* Focke

*Rubus moluccanus* L.

*Rubus niveus* Wallich

#### SAXIFRAGACEAE

*Bergenia purpurascens* (Hook. f. & Thomson) Engl.

*Dichroa frbrifuga* Lour.

*Saxifraga aristulata* Hook. f. & Thomson.

#### CRASSULACEAE

*Sedum* spp.

#### HAMAMELIDACEAE

*Altingia excelsa* Noronha (Jutuli)

*Bucklandia populnea* R. Br. (Pipli)

#### COMBRETACEAE

*Combretum decandrum* Roxb.

*Terminalia arjuna* Wight & Arnott (Arjun)

*Terminalia bellerica* (Gaertn.) Roxb. (Bahera)

*Terminalia chebula* Retz.

*Terminalia myriocarpa* Heurck & Muell. Arg. (Hollock)

#### MYRTACEAE

*Eucalyptus citridora* Hook.

*Syzygium cumini* (L.) Skeels (Jamuk)

#### MELASTOMATACEAE

*Anplectrum assamicum* C. B. Clarke

*Medinilla himalayana* Hook. f. ex Triana

*Melastoma malabathricum* L. (Phutuka)

*Osbeckia japonica* Naud.

*Osbeckia stellata* Wallich

#### LYTHRACEAE

*Cuphea* sp.

*Duabanga grandiflora* Walp. (Khokun)

*Lagerstroemia speciosa* Pers.

#### CARICACEAE

*Carica papaya* L.

#### CUCURBITACEAE

*Benincasa hispida* Cogn.

*Cucurbita maxima* Duchesne (Kaddu)

*Momordica charantia* L. (Karela)

#### BEGONIACEAE

*Begonia nepalensis* Warb.

*Begonia sikkimensis* A. DC.

#### DATISCEAE

*Tetrameles nudiflora* R. Br.L.

#### APIACEAE

*Centella asiatica* (L.) Urban (Manimuni)

#### ARALIACEAE

*Brassaiopsis aculeata* Seem.

*Schefflera venulosa* Harms

**CORNACEAE**

*Cornus controversa* Hemsl.

*Nyssa javanica* Wangerin

**ALANGIACEAE**

*Alangium chinense* (Lour.) Harms.

**SAMBUCACEAE**

*Sambucus* sp.

**RUBIACEAE**

*Anthocephalus chinensis* (Lam.) A. Rich. ex Walp. (Kadamb)

*Canthium glabrum* Blume

*Hedyotis* sp.

*Mussaenda roxburghii* Hook. f.

**DIPSACACEAE**

*Dipsacus atratus* Hook. f. & Thomson ex C. B. Clarke

**ASTERACEAE**

*Ageratum conyzoides* L.

*Anaphalis contorta* (D. Don) Hook. f.

*Artemisia maritima* L.

*Artemisia nilagirica* Pampen.

*Aster albescens* (DC.) Hand.-Mazz.

*Aster sikkimensis* Hook. f. & Thomson

*Bidens bipinnata* L.

*Blumea laciniata* DC.

*Dichrocephala integrifolia* (L. f.) Kuntze

*Eupatorium odoratum* L.

*Gnaphalium canum* Wallich

*Saussurea* sp.

*Senecio densiflorus* Wallich

*Siegesbeckia orientalis* L.

*Sphaeranthus paniculatus* Cass.

*Vernonia volkammeriaefolia* DC.

**CAMPANULACEAE**

*Campanula pallida* Wallich

*Codonopsis affinis* Hook. f. & Thomson

**ERICACEAE**

*Agapetes* spp.

*Rhododendron arboretum* Sm.

*Rhododendron calostrotum* Balf. f. & Ward

*Rhododendron cephalanthum* Franch

*Rhododendron griffithianum* Wight

*Rhododendron tephropeplum* Balf. f. & Forrest

*Vaccinium* spp.

**MYRSINACEAE**

*Ardisia virens* Kurz

*Maesa indica* Wallich

*Myrsine* sp.

**EBENACEAE**

*Diospyros variegata* Kurz

**APOCYNACEAE**

*Alstonia scholaris* R. Br. (Satian)

**LOGANIACEAE**

*Buddleia asiatica* Lour.

*Buddleia candida* Dunn

**GENTIANACEAE**

*Gentiana* spp.

**CONVOLVULACEAE**

*Argyreia argentea* Arnott ex Choisy

*Ipomoea fistulosa* Jacq. Subsp. *fistulosa* (Mart. ex Choisy) D. F. Austin

**SOLANACEAE**

*Capsicum annuum* L.

*Solanum indicum* L.

*Solanum torvum* Sw.

*Solanum tuberosum* L. f.

**GESNERIACEAE**

*Aeschynanthus acuminata* Wallich

*Chirita acuminata* R. Br.

*Chirita mishmiensis* Debbarm. ex Biswas

*Rhynchotechum ellipticum* DC.

**BIGNONIACEAE**

*Stereospermum chelonoides* (L. f.) DC. (Paroli)

**ACANTHACEAE**

*Strobilanthes* sp.

**VERBENACEAE**

*Callicarpa arborea* Roxb.

*Clerodendron colebrookianum* Walp.

*Clerodendron griffithianum* C. B. Clarke

*Gmelina arborea* Roxb. (Gamari)

**LAMIACEAE**

*Colebrookia* spp.

**CHENOPODIACEAE**

*Chenopodium* sp.

*Spinacia oleracia* L. (Palak)

**POLYGONACEAE**

*Polygonum capitatum* Buch.-Ham. ex D. Don

*Polygonum chinense* L.

*Polygonum microcephalum* D. Don

**PIPERACEAE**

*Piper betel* Blanco

*Piper nigrum* L. (Kali mirch)

*Piper trioicum* Roxb.

**LAURACEAE**

*Actinodaphne obovata* Blume

*Alseodaphne andersonii* (King ex Hook. f.) Kosterm.

*Cinnamomum glaucescens* (Nees) Hand.-Mazz. (Gonsorai)

*Cinnamomum tamala* T. Nees (Tejpat)

*Litsea cubeba* (Lour.) Pers.

*Litsea kurzii* King ex Hook. f.

*Phoebe cooperiana* P. C. Kanj. & Das (Mekahi)

**THYMELAEACEAE**

*Daphne involucrata* Wallich

**EUPHORBIACEAE**

*Bischofia javanica* Blume (Urium)

*Glochidion* sp.

*Macaranga denticulata* (Blume) Muell. Arg.

*Macaranga roxburghii* Wight

*Mallotus nepalensis* Muell. Arg.

*Phyllanthus emplica* L.

*Ostodes paniculata* Blume

*Sapium baccatum* Roxb. (Selleng)

#### URTICACEAE

*Elatostema* sp.

*Pouzolzia bennettiana* Wight

*Pouzolzia sanguinea* (Blume) Merr.

*Sarcochlamys pulcherrima* Gaudich.

*Urtica dioica* L.

#### ULMACEAE

*Trema orientalis* (L.) Blume

#### MORACEAE

*Artocarpus chaplasi* Roxb. (Sam)

*Artocarpus lakoocha* Roxb. (Dewasali)

*Ficus gasparriniana* Miq.

*Ficus glomerata* Roxb.

*Ficus religiosa* L. (Peepal)

*Ficus semicordata* Buch.-Ham. ex Sm.

*Ficus squamosa* Roxb.

*Morus laevigata* Wallich (Bola)

*Poikilospermum suaveolens* (Blume) Merr.

#### JUGLANDACEAE

*Engelhardtia spicata* Blume

#### BETULACEAE

*Alnus nepalensis* D. Don (Utis)

*Betula alnoides* Buch.-Ham. (Birch)

#### FAGACEAE

*Castanopsis indica* A. DC. (Hingori)

*Quercus fenestrata* Roxb.

*Quercus griffithii* Hook. f. & Thomson ex Miq.

*Quercus lamellosa* Sm.

*Quercus semiserrata* Roxb.

#### SALICACEAE

*Salix* spp.

#### ORCHIDACEAE

*Aerides fieldingii* Lodd. ex E. Morr.

*Aerides multiflorum* Roxb.

*Agrostophyllum brevipes* King & Pantl.

*Anthogonium gracile* Wallich

*Bulbophyllum affine* Lindl.

*Bulbophyllum careyanum* Spreng.

*Bulbophyllum cauliflorum* Hook. f.

*Calanthe angusta* Lindl.

*Calanthe chloroleuca* Lindl.

*Calanthe masuca* Lindl.

*Calanthe plantaginea* Lindl.

*Cleisostoma aspersum* (Rchb. f.) Garay

*Cleisostoma paniculatum* (Ker-Gawl.) Garay

*Coelogyne asperata* Lindl.

*Coelogyne barbata* Lindl. ex Griff.

*Coelogyne corymbosa* Lindl.

*Coelogyne fuscescens* Lindl.

*Coelogyne mossiae* Rolfe (*Vulnerable as per BSI Red Data Book*)

*Coelogyne ochracea* Lindl.

*Cymbidium cyperifolium* Wallich

*Cymbidium eberneum* Lindl.

*Cymbidium elegans* Lindl.

*Cymbidium giganteum* Wallich

*Cymbidium longifolium* D. Don

*Dendrobium aurantiacum* Reichb. f. (*Endangered as per BSI Red Data Book*)

*Dendrobium crysanthum* Wallich

*Dendrobium densiflorum* Wallich

*Dendrobium devonianum* Paxt.

*Dendrobium falconeri* Hook.

*Dendrobium hookerianum* Lindl.

*Dendrobium moschatum* (Buch.-Ham.) Sw.

*Diplomeris pulchella* D. Don

*Epipogium indicum* H. J. Chowdhery, G. D. Pal & G. S. Giri

*Galeola falconeri* Hook. f.

*Paphiopedilum fairieanum* (Lindl.) Stein (*Endangered as per BSI Red Data Book*)

*Paphiopedilum hirsutissimum* Pfitz.

*Paphiopedilum venustum* Pfitz. (*Vulnerable as per BSI Red Data Book*)

*Rhynchostylis retusa* (L.) Blume

*Vanda coerulea* Griff. ex Lindl. (*Rare as per BSI Red Data Book*)

*Vanda teres* Lindl.

#### ZINGIBERACEAE

*Alpinia molucana* Gagnep.

*Alpinia nigra* (Gaertn.) B. L. Burtt

*Amomum maximum* Roxb.

*Curcuma amada* Roxb.

*Curcuma longa* L. (Haldi)

*Globba clarkei* Baker

*Globba multiflora* Wallich

*Hedychium coronarium* J. Koenig

*Zingiber officinale* Roscoe (Adrakh)

#### COSTACEAE

*Costus speciosa* (J. Koenig) Sm.

#### MARANTACEAE

*Phrynium pubenerve* Blume

#### MUSACEAE

*Musa balbisiana* Colla

*Musa paradisiaca* L.

#### BROMELIACEAE

*Ananas comosus* Merr. (Ananas)

#### IRIDACEAE

*Iris* sp.



**TACCACEAE**

*Tacca cristata* Jacq.

*Tacca integrifolia* Ham. ex Hook. f.

**DIOSCOREACEAE**

*Dioscorea bulbifera* L.

*Dioscorea globosa* Roxb.

**LILIACEAE**

*Allium sativum* L.

*Chlorophytum tuberosum* Baker

*Disporum cantonirnsse* (Lour.) Merr.

*Disporum hamiltonianum* D. Don

*Draceana angustifolia* Roxb.

**COMMELINACEAE**

*Commelina maculata* Edgew.

**ARECACEAE**

*Arenga pinnata* Merr.

*Calamus erectus* Roxb. (Cane)

*Calamus flagellum* Griff. ex Mart. (Cane)

*Calamus floribundus* Griff. (Cane)

*Calamus ornatus* Blume ex Schult. f. (Cane)

*Calamus tenuis* Roxb. (Cane)

**PANDANACEAE**

*Pandanus odoratissimus* L. f. (Ketki)

**ARACEAE**

*Acorus calamus* L.

*Alocasia indica* Schott

*Arisaema concinnum* Schott

*Arisaema rhizomatum* C. E. C. Fischer

*Colocasia* sp.

*Rhaphidophora decursiva* Scott.

**CYPERACEAE**

*Carex baccans* Nees

*Carex cruciata* Wahlenb.

*Carex fuscifructus* C. B. Clarke  
*Cyperus brevifolius* Hassk.  
*Eleocharis tetraquetra* Nees  
*Fimbristylis* sp.  
*Mariscus sumatrensis* (Retz.) J. Raynal  
*Pycneus flavidus* (Retz.) T. Koyama

**POACEAE**

*Agrostis griffithiana* (Hook. f.) Bor  
*Arundinella bengalensis* (Spreng.) Druce  
*Arundo donax* L.  
*Bambusa pallida* Munro (Bamboo)  
*Bambusa tulda* Roxb. (Bamboo)  
*Bromus* sp.  
*Capillipedium assimile* A. Camus  
*Cephalostachyum latifolium* Munro  
*Chimonobambusa callosa* Nakai  
*Chimonobambusa griffithiana* Nakai  
*Chimonocalamus griffithianus* (Munro) C. J. Hsueh & T. P. Yi  
*Chrysopogon aciculatus* Trin.  
*Cynodon dactylon* (L.) Pers.  
*Dendrocalamus giganteus* Munro (Bamboo)  
*Dendrocalamus hamiltonii* Nees & Arnott ex Munro (Bamboo)  
*Dendrocalamus hookeri* Munro (Bamboo)  
*Dendrocalamus sikkimensis* Gamble ex Oliver (Bamboo)  
*Dendrocalamus strictus* Nees (Bamboo)  
*Dinochloa maclellandii* Kurz  
*Erianthus ravennae* P. Beauv.  
*Festuca* sp.  
*Imperata cylindrica* (L.) Raeuschel.  
*Oryza sativa* L.  
*Panicum palmifolium* Poir.  
*Paspalum scorbiculatum* Steud.  
*Phragmites karka* (Retz.) Trin. ex Steud.  
*Phyllostachys bambusoides* Sieb. & Zucc.

*Pogonatherum paniceum* Hackel  
*Pseudostachyum polymorphum* Munro  
*Saccharum arundinaceum* Retz.  
*Saccharum spontaneum* L.  
*Setaria palmifolia* Stapf  
*Stipa* spp.  
*Themeda villosa* Hack.  
*Thysanolaena maxima* (Roxb.) Kuntze  
*Zea mays* L. (Makka)

#### 4.1.4 Gymnosperms

A list of gymnosperms found in submergence and 7 km radius area is given as under in table 4.1:

**Table 4.1: List of Gymnosperms**

S. No.	Botanical Names	Family
1	<i>Abies densa</i> Griff.	Pinaceae
2	<i>Abies spectabilis</i> Spach	Pinaceae
3	<i>Amentotaxus assamica</i> D. K. Ferguson	Taxaceae
4	<i>Cephalotaxus griffithii</i> Hook. f.	Taxaceae
5	<i>Cupressus torulosa</i> D. Don	Cupressaceae
6	<i>Gnetum gnemon</i> L.	Gnetaceae
7	<i>Gnetum montanum</i> Markgraf	Gnetaceae
8	<i>Juniperus recurva</i> Buch.-Ham. ex D. Don	Cupressaceae
9	<i>Larix griffithiana</i> (Lindl. & Gord.) Carrière	Pinaceae
10	<i>Pinus armandi</i> Franch.	Pinaceae
11	<i>Pinus merkusii</i> Jungh. & De Vriese	Pinaceae
12	<i>Pinus spinulosa</i> Griff.	Pinaceae
13	<i>Pinus wallichiana</i> A. B. Jackson	Pinaceae
14	<i>Podocarpus neriifolia</i> D. Don	Podocarpaceae
15	<i>Tsuga dumosa</i> Eichl.	Pinaceae
16	<i>Taxus baccata</i> L.	Taxaceae

#### 4.1.5 Pteridophytes

A list of pteridophytes found in submergence and 7 km radius area is given as under in table 4.2:

**Table 4.2: List of Pteridophytes**

S. No.	Botanical Names	Family
1	<i>Adiantum</i> spp.	Polypodiaceae
2	<i>Angiopteris evecta</i>	Angiopteridaceae
3	<i>Asplenium nidus</i>	Aspleniaceae
4	<i>Blechnum orientale</i>	Blechnaceae
5	<i>Cyathia spinulosa</i>	Cyathiaceae
6	<i>Diplazium esculentum</i>	Athyriaceae
7	<i>Dipteris wallichii</i>	Dipteridaceae
8	<i>Dryopteris</i> sp.	Pteridaceae
9	<i>Equisetum arvense</i>	Equisitaceae
10	<i>Equisetum debile</i>	Equisitaceae
11	<i>Isoetes</i> sp.	Isoetaceae
12	<i>Lycopodium cernum</i>	Lycopodiaceae
13	<i>Lycopodium complanatum</i>	Lycopodiaceae
14	<i>Lycopodium phlegmaria</i>	Lycopodiaceae
15	<i>Lycopodium serratum</i>	Lycopodiaceae
16	<i>Marsilea</i> sp.	Marsileaceae
17	<i>Polypodium</i> sp	Polypodiaceae
18	<i>Psilotum nudum</i> (Rare as per BSI Red Data Book)	Psilotaceae
19	<i>Pteridium</i> sp.	Pteridaceae
20	<i>Selaginella repanda</i>	Selaginellaceae
21	<i>Selaginella</i> sp.	Selaginaceae
22	<i>Selaginella subdiaphana</i>	Selaginellaceae
23	<i>Tectaria trifolia</i>	Aspidiaceae
24	<i>Vittaria</i> sp.	Vittariaceae

#### 4.1.6 Bryophytes

A list of bryophytes found in submergence and 7 km radius area is given as under in table 4.3:

**Table 4.3: List of Bryophytes**

S. No.	Botanical Names	Family
1	<i>Anthoceros sp.</i>	Anthocerotaceae
2	<i>Atrichum undulatum</i>	Polytrichaceae
3	<i>Dawsonia grandis</i>	Polytrichaceae
4	<i>Hypnum imponens</i>	Hypnaceae
5	<i>Leucodon sp.</i>	Leucodontaceae
6	<i>Marchantia palmata</i>	Marchantiaceae
7	<i>Marchantia polymorpha</i>	Marchantiaceae
8	<i>Pellia sp.</i>	Pelliaceae
9	<i>Pogonatum inflexum</i>	Polytrichaceae
10	<i>Polytrichum sp.</i>	Politrichaceae
11	<i>Polytrichum commune</i>	Polytrichaceae
12	<i>Riccia sp.</i>	Ricciaceae
13	<i>Riccia fluitans</i>	Ricciaceae
14	<i>Sphagnum sp.</i>	Sphagnaceae
15	<i>Sphagnum strictum</i>	Sphagnaceae
16	<i>Thuidium delicatum</i>	Thuidiaceae

#### 4.1.7 Algae

A list of algal species found in submergence and 7 km radius area is given as under in table 4.4:

**Table 4.4: List of Algae**

S. No.	Botanical Names	Family
1	<i>Anabaena azollae</i>	Nostocaceae
2	<i>Chara sp.</i>	Characeae
3	<i>Chlamydomonas sp.</i>	Chlamydomonadaceae
4	<i>Coleochaete sp.</i>	Coleochaetaceae
5	<i>Ectocarpus sp.</i>	Ectocarpaceae

6	<i>Hydrodictyon</i> sp.	Hydrodictyaceae
7	<i>Nostoc</i> sp.	Nostocaceae
8	<i>Oedogonium</i> sp.	Oedogoniaceae
9	<i>Sargassum</i> sp.	Sargassaceae
10	<i>Spirogyra condensata</i>	Zygnemataceae
11	<i>Vaucheria</i> sp.	Vaucheriaceae
12	<i>Zygnema</i> sp.	Zygnemataceae

#### 4.1.8 Fungi

A list of fungal species found in submergence and 7 km radius area is given as under in table 4.5:

**Table 4.5: List of Fungi**

S. No.	Botanical Names	Family
1	<i>Agaricus campestris</i>	Agaricaceae
2	<i>Armillariella</i> sp.	Tricholomataceae
3	<i>Coprinus</i> sp.	Coprinaceae
4	<i>Ganoderma</i> sp.	Ganodermataceae
5	<i>Lepiota mastoides</i>	Agaricaceae
6	<i>Morchella esculenta</i>	Morchellaceae
7	<i>Polyporus</i> sp.	Polyporaceae
8	<i>Polystictus</i> sp.	Polyporaceae
9	<i>Volvariella tetrastria</i>	Pluteaceae

#### 4.1.9 Economic Plants

The Lower Dibang Valley and Dibang Valley districts of Arunachal Pradesh are true representatives of East Himalayan Biodiversity. The area comprises a large number of economically important plants:

#### 4.1.10 Medicinal Plants

Many herbs and shrubs including tree and climbers have been used traditionally by the local people as medicinal plants for the treatment of different ailments. Some of these plants have been smuggled through international borders by the active participation of the local people for money.

Due to this reason and other ecological factors many of these plants are on the verge of extinction. So due protection and preservation is warranted from the public as well as concerned Government agencies. A few medicinal plants observed frequently during the survey period have been mentioned below-

*Alstonia scholaris, Acorus calamus, Clematis gouriana, Coptis teeta, Dillenia indica, Cissampelos pareira, Gynocardia odorata, Sida acuta, Urena lobata, Bauhinia vahlii, Rubus moluccanus, Cotoneaste, Terminalia arjuna, T. bellirica, Maesa indica, Gentiana sp., Strobilanthes sp., Piper betel, Cinnamomum tamala, Betula alnoides, Hedychium coronarium, Costus speciosus, Arundo donax, Alpinia molucana, Curcuma longa etc.*

#### **4.1.11 Ornamental Plants**

The whole Arunachal Reserve Forests can be termed as greenery for ornamental plants mostly orchids and other flowering plants. These ornamental plants mostly include orchids, Rhododendrons, Begonias and some others. A few of them frequently observed during the survey period have been mentioned below:

##### **(A) Orchids**

*Aerides fieldingii, Aerides multiflorum, Agrostophyllum brevipes, Anthogonium gracile, Bulbophyllum affine, Bulbophyllum careyanum, Bulbophyllum cauliflorum, Calanthe angusta, Calanthe chloroleuca, Calanthe masuca, Calanthe plantaginea, Cleisostoma aspersum, Cleisostoma paniculatum, Coelogyne asperata, Coelogyne barbata, Coelogyne corymbosa, Coelogyne fuscescens, Coelogyne ochracea, Cymbidium cyperifolium, Cymbidium eberneum, Cymbidium elegans, Cymbidium giganteum, Cymbidium longifolium, Dendrobium crisanthum, Dendrobium densiflorum, Dendrobium devonianum, Dendrobium falconeri, Dendrobium hookerianum, Dendrobium moschatum, Diplomeris pulchella, Epipogium indicum, Galeola falconeri, Paphiopedilum fairieanum, Paphiopedilum hirsutissimum, Paphiopedilum venustum, Rhynchostylis retusa, Vanda coerulea, Vanda teres.*

## (B) Rhododendrons, Begonias & Hedychiums

*Rhododendron arboretum*, *R. calostrotum*, *R. cephalanthum*, *R. griffithianum*, *R. tephropeplum*, *Begonia nepalensis*, *B. sikkimensis*, *Hedychium coronarium*.

### 4.1.12 Edible plants

*Allium sativum*, *Ananas comosus*, *Brassica rapa* subsp. *Campestris*, *Capsicum annum*, *Carica papaya*, *Citrus aurantifolia*, *Citrus limon*, *Citrus reticulata*, *Cucurbita maxima*, *Curcuma longa*, *Fragaria indica*, *Momordica charantia*, *Musa paradisiaca*, *Oryza sativa*, *Piper betel*, *Piper nigrum*, *Psidium guayava*, *Solanum tuberosum*, *Spinacia oleracea*, *Zea mays*, *Zingiber officinale*.

### 4.1.13 Timber yielding plants

The project area has several valuable timber yielding plants. The important timber plants found during the survey period is listed below:

*Acer acuminata*, *Aglaia spectabilis*, *Ailanthus grandis*, *Albizia lebbek*, *A. lucida*, *Alnus nepalensis*, *Alseodaphne andersonii*, *Amoora wallichii*, *Betula alnoides*, *Bombax ceiba*, *Castanopsis indica*, *Chukrassia tabularis*, *Dalbergia sissoo*, *Duabanga grandiflora*, *Elaeocarpus grandifolius*, *Gmelina arborea*, *Litsea cubeba*, *Magnolia hookeri*, *Magnolia griffithii*, *Michelia cathcartii*, *Morus laevigata*, *Pterospermum acerifolium*, *Sterculea urens*, *Sterculia villosa*, *Terminalia arjuna*, *Terminalia myriocarpa*, *Toona ciliata*.

### 4.1.14 Endangered Species of Flora

Endangered species of plants (as per Botanical Survey of India Red Data Book) found in the submergence area and 7 km radius are presented in table 4.6.

**Table 4.6: List of endangered species**

Sl. No.	Endangered species	Whether found in Submergence area	Whether found in 7 km radius
1	<i>Aconitum ferox</i>	Yes	Yes



2	<i>Coelogyne mossiae</i>	Yes	Yes
3	<i>Dendrobium aurantiacum</i>	Yes	Yes
4	<i>Paphiopedilum fairieanum</i>	Yes	Yes
5	<i>Paphiopedilum venustum</i>	Yes	Yes
6	<i>Vanda coerulea</i>	Yes	Yes
7	<i>Bombax insigne</i> var. <i>polystemon</i>	No	Yes
8	<i>Pterospermum reticulatum</i>	No	Yes
9	<i>Psilotum nudum</i>	No	Yes

#### **4.1.15 Phyto-sociological Studies**

The sampling was done within 1 km of the riverbed. Considering the difficult terrain, quadrat method was used for vegetation sampling. The phytosociological data for trees/bamboos/canes/shrubs were collected from the random quadrats of 100 x 100 m size laid during the pre-monsoon period vegetation survey and demarcated with waterproof paints. Random quadrats of 1 x 1 m size were laid for the study of herb component.

During the survey, number of plants of different species identified in each quadrat was counted. The height of individual trees was estimated using an Abney level/ Binocular and the DBH of all trees having height more than 8 m was measured.

Based on the quadrat data, Frequency, Density and Cover (basal area) of each species was calculated. The Importance Value Index (IVI) values for different tree species were determined by summing up the Relative Density, Relative Frequency and Relative Cover values. The Relative Density and Relative Frequency values were used to calculate the IVI of shrubs and herbs. The volume of wood for trees was estimated using the data on DBH (measured at 1.5 m above the ground level) and height. The volume was estimated using the formula:  $\pi r^2 h$ , where r is the radius and h is the estimated height of the bole of the tree. The data on density and volume were presented in per ha basis.

The similarity in terms of species content between the two sampling sites was measured through Sorensen's Similarity Index using the formula:

$2C/A+B$

where C is the No. of species common to both the sampling sites

A is the No. of species found at first site

and B is the No. of species found at second site

Two species diversity indices viz., Shannon index of general diversity (H) and Evenness index (e) were computed using the following formula:

Shannon index of general diversity (H):  $-\sum P_i \log P_i$

where  $n_i$  = importance value for each species

N = total importance values

$P_i$  = importance probability for each species =  $n_i / N$

Evenness index (e):  $H / \log S$

where H = Shannon index of general diversity

and S = number of species

IVI values were used for computation of both the diversity indices.

The detailed analysis is attached as annex 1.

During the vegetation survey, herbaria were prepared for the plants those had flowers. Rare and endangered species were identified referring to the Red Data Book of BSI and other available literature, flora and herbarium pertaining to the rare/endangered species of Arunachal Pradesh.

Table 4.7: Quadrata Analysis

S. No.	Type	Name of the Plant	Circumference (cm)	Radius (R) in cm	R <sup>2</sup> in cm <sup>2</sup>	Basal Area (JR <sup>2</sup> ) in cm <sup>2</sup>	Basal area x No. of plants	Relative dominance	Q-1 (PC)	Q-2 (PC)	Q-3 (TP)	Q-4 (TP)	Q-5 (K)	Q-6 (K)	Q-7 (K)	Q-8 (K)	Q-9 (E)	Q-10 (E)	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1	Bamboo	<i>Chimonocalamus griffithianus</i>	7.9	1.26	1.58	4.97	34.76	0.00019							7				
2	Bamboo	<i>Dendrocalamus strictus</i>	5.8	0.92	0.85	2.68	26.76	0.00015						4	6				
3	Bamboo	<i>Dendrocalamus hookeri</i>	5.2	0.83	0.68	2.15	32.27	0.00018					8	4			3		
4	Bamboo	<i>Dendrocalamus sikkimensis</i>	6.8	1.08	1.17	3.68	66.22	0.00036					12			3	3		
5	Bamboo	<i>Dendrocalamus hamiltonii</i>	6.4	1.02	1.04	3.26	65.17	0.00036					7	5	11	5	4		
6	Bamboo	<i>Dendrocalamus giganteus</i>	5.4	0.86	0.74	2.32	34.80	0.00019					11	7	15	4	2		
7	Bamboo	<i>Bambusa sp.</i>	49	7.80	60.80	191.02	7067.61	0.03866					12	17	34	17	14		
8	Bamboo	<i>Bambusa tulda</i>	56	8.91	79.42	249.49	23452.14	0.12828					20	23	47	10	19		
9	Bamboo	<i>Bambusa pallida</i>	40	6.37	40.52	127.29	15147.66	0.08285					8			8			
10	Herb	<i>Chirita mishmiensis</i>	0.85	0.14	0.02	0.06	0.92	0.00001	8										
11	Grass	<i>Pogonatherum paniceum</i>	0.95	0.15	0.02	0.07	0.57	0.00000			1								
12	Herb	<i>Senecio densiflorus</i>	1	0.16	0.03	0.08	1.27	0.00001		9				7					
13	Herb	<i>Coptis teeta</i>	0.65	0.10	0.01	0.03	0.74	0.00000		9			13						
14	Herb	<i>Curcuma amada</i>	6	0.95	0.91	2.86	54.42	0.00030			5					8	6		
15	Herb	<i>Chlorophytum tuberosum</i>	0.91	0.14	0.02	0.07	1.58	0.00001			4		11				9		
16	Herb	<i>Lycopodium sp.</i>	0.27	0.04	0.00	0.01	0.18	0.00000	18					8				5	
17	Herb	<i>Amomum maximum</i>	4.22	0.67	0.45	1.42	29.75	0.00016			4			6			7	4	
18	Herb	<i>Tacca integrifolia</i>	1.11	0.18	0.03	0.10	2.55	0.00001	10					5	5		6		
19	Herb	<i>Zingiber sp.</i>	0.87	0.14	0.02	0.06	2.41	0.00001		17			10				8		5
20	Herb	<i>Alpinia nigra</i>	0.67	0.11	0.01	0.04	2.21	0.00001	20								9	33	
21	Herb	<i>Globba multiflora</i>	0.57	0.09	0.01	0.03	2.12	0.00001		41			41						
22	Herb	<i>Viola canescens</i>	0.33	0.05	0.00	0.01	0.39	0.00000	13			1	12		19				
23	Herb	<i>Sida acuta</i>	0.41	0.07	0.00	0.01	0.86	0.00000	19				33					12	
24	Herb	<i>Aconitum ferox</i>	0.27	0.04	0.00	0.01	0.28	0.00000	12				21		9			6	
25	Herb	<i>Acorus calamus</i>	0.79	0.13	0.02	0.05	2.63	0.00001		12				4	24			13	
26	Herb	<i>Aconitum lethale</i>	0.43	0.07	0.00	0.01	0.57	0.00000	11		3		9			9	7		
27	Herb	<i>Drymaria diandra</i>	0.22	0.04	0.00	0.00	0.60	0.00000	19	47			44		46				
28	Herb	<i>Commelina maculata</i>	0.75	0.12	0.01	0.04	6.67	0.00004		37	10	3				44	21	34	
29	Herb	<i>Agrostis griffithiana</i>	0.74	0.12	0.01	0.04	6.06	0.00003		33	8		39	7		23	10	19	
30	Herb	<i>Alocasia indica</i>	0.79	0.13	0.02	0.05	8.74	0.00005	29	18		4	79	11	35				
31	Herb	<i>Fragaria indica</i>	0.81	0.13	0.02	0.05	10.75	0.00006	21	32			89	12			39	13	
32	Herb	<i>Polygonum sp.</i>	0.34	0.05	0.00	0.01	1.89	0.00001		49	12	2	34		35	21	25	27	
33	Herb	<i>Begonia nepalensis</i>	0.56	0.09	0.01	0.02	5.54	0.00003	19		9		38	26	61	34	24	11	
34	Herb	<i>Ageratum conyzoides</i>	0.56	0.09	0.01	0.02	17.81	0.00010	51	46	13	6	227	34	153	122	51	11	
35	Grass	<i>Saccharum arundinaceum</i>	3.1	0.49	0.24	0.76	3.06	0.00002							4				
36	Grass	<i>Pseudostachyum polymorphum</i>	1.9	0.30	0.09	0.29	1.44	0.00001									5		
37	Grass	<i>Saccharum spontaneum</i>	3.21	0.51	0.26	0.82	7.38	0.00004					9						
38	Sedge	<i>Cyperus brevifolius</i>	0.44	0.07	0.00	0.02	0.40	0.00000			17							9	
39	Grass	<i>Themeda villosa</i>	2.23	0.35	0.13	0.40	3.96	0.00002					2					8	
40	Sedge	<i>Eleocharis tetraquetra</i>	1.59	0.25	0.06	0.20	4.83	0.00003					5					8	11
41	Grass	<i>Paspalum scorbulatum</i>	0.2	0.03	0.00	0.00	0.20	0.00000				64							
42	Sedge	<i>Mariscus sumatrensis</i>	0.24	0.04	0.00	0.00	0.35	0.00000				77							
43	Grass	<i>Thysanolaena maxima</i>	2.43	0.39	0.15	0.47	16.44	0.00009				27		2				1	5

S. No.	Type	Name of the Plant	Total No. of Individuals	Quadrat of occurrence	Total No of Quadrat Studied	General Abundance	General Frequency	Relative frequency	Relative Density	Relative dominance	Importance Value Index	ni/N	Log(ni/N)	Shannon Index (H) = - (ni/N) x log(ni/N)
			17	18	19	20	21	22	23	24	25	26	27	28
1	Bamboo	<i>Chimonocalamus griffithianus</i>	7	1	10	0.7	10	0.24	0.09	0.00	0.32722	0.0009	-3.0537	0.003
2	Bamboo	<i>Dendrocalamus strictus</i>	10	2	10	1	20	0.48	0.13	0.00	0.60370	0.0013	-2.8988	0.004
3	Bamboo	<i>Dendrocalamus hookeri</i>	15	3	10	1.5	30	0.72	0.19	0.00	0.90551	0.0019	-2.7227	0.005
4	Bamboo	<i>Dendrocalamus sikkimensis</i>	18	3	10	1.8	30	0.72	0.23	0.00	0.94357	0.0023	-2.6436	0.006
5	Bamboo	<i>Dendrocalamus hamiltonii</i>	20	3	10	2	30	0.72	0.25	0.00	0.96881	0.0025	-2.5978	0.007
6	Bamboo	<i>Dendrocalamus giganteus</i>	15	4	10	1.5	40	0.95	0.19	0.00	1.14419	0.0019	-2.7227	0.005
7	Bamboo	<i>Bambusa sp.</i>	37	4	10	3.7	40	0.95	0.47	0.04	1.46037	0.0047	-2.3306	0.011
8	Bamboo	<i>Bambusa tulda</i>	94	5	10	9.4	50	1.19	1.19	0.13	2.50816	0.0119	-1.9257	0.023
9	Bamboo	<i>Bambusa pallida</i>	119	5	10	11.9	50	1.19	1.50	0.08	2.77832	0.0150	-1.8233	0.027
10	Herb	<i>Chirita mishmiensis</i>	16	1	10	1.6	10	0.24	0.20	0.00	0.44064	0.0020	-2.6947	0.005
11	Grass	<i>Pogonatherum paniceum</i>	8	2	10	0.8	20	0.48	0.10	0.00	0.57831	0.0010	-2.9957	0.003
12	Herb	<i>Senecio densiflorus</i>	16	2	10	1.6	20	0.48	0.20	0.00	0.67930	0.0020	-2.6947	0.005
13	Herb	<i>Coptis teeta</i>	22	2	10	2.2	20	0.48	0.28	0.00	0.75504	0.0028	-2.5564	0.007
14	Herb	<i>Curcuma amada</i>	19	3	10	1.9	30	0.72	0.24	0.00	0.95613	0.0024	-2.6201	0.006
15	Herb	<i>Chlorophytum tuberosum</i>	24	3	10	2.4	30	0.72	0.30	0.00	1.01895	0.0030	-2.5186	0.008
16	Herb	<i>Lycopodium sp.</i>	31	3	10	3.1	30	0.72	0.39	0.00	1.10731	0.0039	-2.4075	0.009
17	Herb	<i>Amomum maximum</i>	21	4	10	2.1	40	0.95	0.27	0.00	1.21990	0.0027	-2.5766	0.007
18	Herb	<i>Tacca integrifolia</i>	26	4	10	2.6	40	0.95	0.33	0.00	1.28287	0.0033	-2.4839	0.008
19	Herb	<i>Zingiber sp.</i>	40	4	10	4	40	0.95	0.50	0.00	1.45959	0.0050	-2.2968	0.012
20	Herb	<i>Alpinia nigra</i>	62	3	10	6.2	30	0.72	0.78	0.00	1.49863	0.0078	-2.1064	0.016
21	Herb	<i>Globba multiflora</i>	82	2	10	8.2	20	0.48	1.04	0.00	1.51243	0.0104	-1.9850	0.021
22	Herb	<i>Viola canescens</i>	45	4	10	4.5	40	0.95	0.57	0.00	1.52269	0.0057	-2.2456	0.013
23	Herb	<i>Sida acuta</i>	64	3	10	6.4	30	0.72	0.81	0.00	1.52387	0.0081	-2.0927	0.017
24	Herb	<i>Aconitum ferox</i>	48	4	10	4.8	40	0.95	0.61	0.00	1.56056	0.0061	-2.2176	0.013
25	Herb	<i>Acorus calamus</i>	53	4	10	5.3	40	0.95	0.67	0.00	1.62369	0.0067	-2.1746	0.015
26	Herb	<i>Aconitum lethale</i>	39	5	10	3.9	50	1.19	0.49	0.00	1.68562	0.0049	-2.3078	0.011
27	Herb	<i>Drymaria diandra</i>	156	4	10	15.6	40	0.95	1.97	0.00	2.92386	0.0197	-1.7057	0.034
28	Herb	<i>Commelina maculata</i>	149	6	10	14.9	60	1.43	1.88	0.00	3.31286	0.0188	-1.7256	0.032
29	Herb	<i>Agrostis griffithiana</i>	139	7	10	13.9	70	1.67	1.75	0.00	3.42528	0.0175	-1.7558	0.031
30	Herb	<i>Alocasia indica</i>	176	6	10	17.6	60	1.43	2.22	0.00	3.65369	0.0222	-1.6533	0.037
31	Herb	<i>Fragaria indica</i>	206	6	10	20.6	60	1.43	2.60	0.00	4.03239	0.0260	-1.5850	0.041
32	Herb	<i>Polygonum sp.</i>	205	8	10	20.5	80	1.91	2.59	0.00	4.49705	0.0259	-1.5871	0.041
33	Herb	<i>Begonia nepalensis</i>	222	8	10	22.2	80	1.91	2.80	0.00	4.71166	0.0280	-1.5525	0.044
34	Herb	<i>Ageratum conyzoides</i>	714	10	10	71.4	100	2.39	9.01	0.00	11.39961	0.0901	-1.0451	0.094
35	Grass	<i>Saccharum arundinaceum</i>	4	1	10	0.4	10	0.24	0.05	0.00	0.28917	0.0005	-3.2968	0.002
36	Grass	<i>Pseudostachyum polymorphum</i>	5	1	10	0.5	10	0.24	0.06	0.00	0.30179	0.0006	-3.1999	0.002
37	Grass	<i>Saccharum spontaneum</i>	9	1	10	0.9	10	0.24	0.11	0.00	0.35231	0.0011	-2.9446	0.003
38	Sedge	<i>Cyperus brevifolius</i>	26	1	10	2.6	10	0.24	0.33	0.00	0.56687	0.0033	-2.4839	0.008
39	Grass	<i>Themeda villosa</i>	10	2	10	1	20	0.48	0.13	0.00	0.60358	0.0013	-2.8988	0.004
40	Sedge	<i>Eleocharis tetraquetra</i>	24	3	10	2.4	30	0.72	0.30	0.00	1.01897	0.0030	-2.5186	0.008
41	Grass	<i>Paspalum scrobiculatum</i>	64	1	10	6.4	10	0.24	0.81	0.00	1.04654	0.0081	-2.0927	0.017
42	Sedge	<i>Mariscus sumatrensis</i>	77	1	10	7.7	10	0.24	0.97	0.00	1.21064	0.0097	-2.0123	0.020
43	Grass	<i>Thysanolaena maxima</i>	35	4	10	3.5	40	0.95	0.44	0.00	1.39655	0.0044	-2.3548	0.010

S. No.	Type	Name of the Plant	Circumference (cm)	Radius (R) in cm	R2 in cm <sup>2</sup>	Basal Area (πR <sup>2</sup> ) in cm <sup>2</sup>	Basal area x No. of plants	Relative dominance	Q-1 (PC)	Q-2 (PC)	Q-3 (TP)	Q-4 (TP)	Q-5 (K)	Q-6 (K)	Q-7 (K)	Q-8 (K)	Q-9 (E)	Q-10 (E)	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
44	Grass	<i>Phragmites karka</i>	3.12	0.50	0.25	0.77	72.80	0.00040				78							
45	Grass	<i>Stipa sp.</i>	2.98	0.47	0.22	0.71	45.22	0.00025			12	34	8	1					9
46	Sedge	<i>Carex baccans</i>	0.87	0.14	0.02	0.06	4.03	0.00002				24	5	1	19			11	7
47	Grass	<i>Panicum palmifolium</i>	0.67	0.11	0.01	0.04	3.79	0.00002			16	34	8	12	32	4			
48	Grass	<i>Cynodon dactylon</i>	0.22	0.04	0.00	0.00	0.64	0.00000			28	30	12	4	29	21	23		19
49	Grass	<i>Pogonatherum paniceum</i>	0.78	0.12	0.02	0.05	9.97	0.00005			21	130	7	8	17				23
50	Sedge	<i>Frimbristylis sp.</i>	0.15	0.02	0.00	0.00	0.52	0.00000			37	155		7	23	11	13	46	
51	Grass	<i>Chrysopogon aciculatus</i>	0.22	0.04	0.00	0.00	1.07	0.00001			46	112	13	8	32	10	17	39	
52	Grass	<i>Imperata cylindrica</i>	0.65	0.10	0.01	0.03	16.17	0.00009			15	423							23
53	Shrub	<i>Rubus moluccanus</i>	3.6	0.57	0.33	1.03	1.03	0.00001			1								
54	Shrub	<i>Clerodendron colebrookeanum</i>	5.5	0.88	0.77	2.41	2.41	0.00001			1								
55	Shrub	<i>Coleobrookea sp</i>	6	0.95	0.91	2.86	25.78	0.00014						9					
56	Shrub	<i>Polygonum chinense</i>	23	3.66	13.40	42.09	505.03	0.00276							12				
57	Shrub	<i>Rubus lucens</i>	6.9	1.10	1.21	3.79	53.03	0.00029									14		
58	Shrub	<i>Medinilla himalayana</i>	9	1.43	2.05	6.44	109.55	0.00060	17										
59	Shrub	<i>Naravella zeylanica</i>	19	3.02	9.14	28.72	603.12	0.00330					21						
60	Shrub	<i>Tamarix dioica</i>	3.8	0.60	0.37	1.15	5.74	0.00003							5				
61	Shrub	<i>Polygonum capitatum</i>	4.7	0.75	0.56	1.76	17.57	0.00010	9			1							
62	Shrub	<i>Solanum indicum</i>	3.6	0.57	0.33	1.03	11.34	0.00006					7	4					
63	Shrub	<i>Polygonum microcephalum</i>	4.2	0.67	0.45	1.40	18.24	0.00010					3						
64	Shrub	<i>Urtica dioica</i>	6.8	1.08	1.17	3.68	51.50	0.00028								7			
65	Shrub	<i>Taluma hodgsoni</i>	12.5	1.99	3.96	12.43	186.46	0.00102	11	4									
66	Shrub	<i>Desmodium multiflorum</i>	4	0.64	0.41	1.27	22.91	0.00013	9						9				
67	Shrub	<i>Rubus niveus</i>	4.1	0.65	0.43	1.34	25.41	0.00014			7				9				
68	Shrub	<i>Solanum torvum</i>	7.8	1.24	1.54	4.84	121.01	0.00066							9			11	5
69	Shrub	<i>Sida acuta</i>	7.1	1.13	1.28	4.01	148.39	0.00081	13				7	8		9			
70	Shrub	<i>Vitis heyneana</i>	5.3	0.84	0.71	2.23	51.40	0.00028			2		6	3	4				8
71	Shrub	<i>Talaua phellocarpa</i>	6.7	1.07	1.14	3.57	107.14	0.00059			13	3	1	5		8			
72	Shrub	<i>Clematis gouriana</i>	7.2	1.15	1.31	4.12	243.33	0.00133	24				18	4	6	7			
73	Shrub	<i>Blumea lacinata</i>	12.11	1.93	3.71	11.67	945.04	0.00517			17	5			11	16	18	14	
74	Shrub	<i>Anaphalis contorata</i>	5.1	0.81	0.66	2.07	124.16	0.00068	16		7	6	7	5			11	7	
75	Shrub	<i>Crotalaria alata</i>	6.2	0.99	0.97	3.06	281.35	0.00154			27	11	12	11	17		8	5	
76	Shrub	<i>Rubus elepticus</i>	5.6	0.89	0.79	2.49	331.82	0.00181	18		22	5	23	15	22	20			7
77	Shrub	<i>Osbeckia sp.</i>	7.9	1.26	1.58	4.97	958.27	0.00524	26		33	4	37	33	32		17	9	
78	Shrub	<i>Eupatorium odoratum</i>	6.4	1.02	1.04	3.26	674.54	0.00369	29		38	7	23	18	31	25	23	13	
79	Shrub	<i>Melastoma malabathricum</i>	17	2.71	7.32	22.99	4552.41	0.02490	38		43	2		15	27	26	32	12	
80	Tree	<i>Betula alnoides</i>	100	15.91	253.24	795.57	3977.85	0.02176								5			
81	Tree	<i>Artocarpus lakoocha</i>	340	54.11	2927.42	9196.79	27590.38	0.15091	3										
82	Tree	<i>Mesua ferrea</i>	290	46.15	2129.73	6690.75	26762.98	0.14639											
83	Tree	<i>Michelia sp</i>	342	54.42	2961.96	9305.31	65137.16	0.35629									4		7
84	Tree	<i>Terminalia myriocarpa</i>	170	27.05	731.86	2299.20	20692.78	0.11318			1			8					
85	Tree	<i>Pterospermum acerifolium</i>	280	44.56	1985.38	6237.27	74847.25	0.40940											12
86	Tree	<i>Bischofia javanica</i>	150	23.87	569.78	1790.03	30430.56	0.16645									8		
87	Tree	<i>Anthocephalus chinensis</i>	410	65.25	4256.92	13373.54	106988.29	0.58520						8					
88	Tree	<i>Kurrimia robusta</i>	320	50.92	2593.15	8146.64	97759.67	0.53472											12

S. No.	Type	Name of the Plant	Total No. of Individuals	Quadrat of occurrence	Total No of Quadrat Studied	General Abundance	General Frequency	Relative frequency	Relative Density	Relative dominance	Importance Value Index	ni/N	Log(ni/N)	Shannon Index (H) = - (ni/N) x log(ni/N)
			17	18	19	20	21	22	23	24	25	26	27	28
44	Grass	<i>Phragmites karka</i>	94	2	10	9.4	20	0.48	1.19	0.00	1.66429	0.0119	-1.9257	0.023
45	Grass	<i>Stipa sp.</i>	64	5	10	6.4	50	1.19	0.81	0.00	2.00144	0.0081	-2.0927	0.017
46	Sedge	<i>Carex baccans</i>	67	6	10	6.7	60	1.43	0.85	0.00	2.27775	0.0085	-2.0728	0.018
47	Grass	<i>Panicum palmifolium</i>	106	6	10	10.6	60	1.43	1.34	0.00	2.77005	0.0134	-1.8735	0.025
48	Grass	<i>Cynodon dactylon</i>	166	8	10	16.6	80	1.91	2.10	0.00	4.00474	0.0210	-1.6787	0.035
49	Grass	<i>Pogonatherum paniceum</i>	206	6	10	20.6	60	1.43	2.60	0.00	4.03239	0.0260	-1.5850	0.041
50	Sedge	<i>Frimbristylis sp.</i>	292	7	10	29.2	70	1.67	3.69	0.00	5.35659	0.0369	-1.4335	0.053
51	Grass	<i>Chrysopogon aciculatus</i>	277	8	10	27.7	80	1.91	3.50	0.00	5.40591	0.0350	-1.4564	0.051
52	Grass	<i>Imperata cylindrica</i>	481	4	10	48.1	40	0.95	6.07	0.00	7.02644	0.0607	-1.2167	0.074
53	Shrub	<i>Rubus moluccanus</i>	1	1	10	0.1	10	0.24	0.01	0.00	0.25129	0.0001	-3.8988	0.000
54	Shrub	<i>Clerodendron colebrookeanum</i>	1	1	10	0.1	10	0.24	0.01	0.00	0.25130	0.0001	-3.8988	0.000
55	Shrub	<i>Colebrookea sp</i>	9	1	10	0.9	10	0.24	0.11	0.00	0.35241	0.0011	-2.9446	0.003
56	Shrub	<i>Polygonum chinense</i>	12	1	10	1.2	10	0.24	0.15	0.00	0.39290	0.0015	-2.8197	0.004
57	Shrub	<i>Rubus lucens</i>	14	1	10	1.4	10	0.24	0.18	0.00	0.41568	0.0018	-2.7527	0.005
58	Shrub	<i>Medinilla himalayana</i>	17	1	10	1.7	10	0.24	0.21	0.00	0.45385	0.0021	-2.6684	0.006
59	Shrub	<i>Naravella zeylanica</i>	21	1	10	2.1	10	0.24	0.27	0.00	0.50705	0.0027	-2.5766	0.007
60	Shrub	<i>Tamarix dioica</i>	5	2	10	0.5	20	0.48	0.06	0.00	0.54047	0.0006	-3.1999	0.002
61	Shrub	<i>Polygonum capitatum</i>	10	2	10	1	20	0.48	0.13	0.00	0.60365	0.0013	-2.8988	0.004
62	Shrub	<i>Solanum indicum</i>	11	2	10	1.1	20	0.48	0.14	0.00	0.61624	0.0014	-2.8574	0.004
63	Shrub	<i>Polygonum microcephalum</i>	13	2	10	1.3	20	0.48	0.16	0.00	0.64153	0.0016	-2.7849	0.005
64	Shrub	<i>Urtica dioica</i>	14	2	10	1.4	20	0.48	0.18	0.00	0.65433	0.0018	-2.7527	0.005
65	Shrub	<i>Taluma hodgsoni</i>	15	2	10	1.5	20	0.48	0.19	0.00	0.66769	0.0019	-2.7227	0.005
66	Shrub	<i>Desmodium multiflorum</i>	18	2	10	1.8	20	0.48	0.23	0.00	0.70467	0.0023	-2.6436	0.006
67	Shrub	<i>Rubus niveus</i>	19	3	10	1.9	30	0.72	0.24	0.00	0.95597	0.0024	-2.6201	0.006
68	Shrub	<i>Solanum torvum</i>	25	3	10	2.5	30	0.72	0.32	0.00	1.03223	0.0032	-2.5009	0.008
69	Shrub	<i>Sida acuta</i>	37	4	10	3.7	40	0.95	0.47	0.00	1.42252	0.0047	-2.3306	0.011
70	Shrub	<i>Vitis heyneana</i>	23	5	10	2.3	50	1.19	0.29	0.00	1.48393	0.0029	-2.5371	0.007
71	Shrub	<i>Taluma phellocarpa</i>	30	5	10	3	50	1.19	0.38	0.00	1.57260	0.0038	-2.4217	0.009
72	Shrub	<i>Clematis gouriana</i>	59	5	10	5.9	50	1.19	0.74	0.00	1.93941	0.0074	-2.1280	0.016
73	Shrub	<i>Blumea lacinata</i>	81	6	10	8.1	60	1.43	1.02	0.01	2.45962	0.0102	-1.9903	0.020
74	Shrub	<i>Anaphalis contorata</i>	60	8	10	6	80	1.91	0.76	0.00	2.66737	0.0076	-2.1207	0.016
75	Shrub	<i>Crotalaria alata</i>	92	9	10	9.2	90	2.15	1.16	0.00	3.31083	0.0116	-1.9350	0.022
76	Shrub	<i>Rubus elepticus</i>	133	9	10	13.3	90	2.15	1.68	0.00	3.82866	0.0168	-1.7750	0.030
77	Shrub	<i>Osbeckia sp.</i>	193	9	10	19.3	90	2.15	2.44	0.01	4.58947	0.0244	-1.6133	0.039
78	Shrub	<i>Eupatorium odoratum</i>	207	9	10	20.7	90	2.15	2.61	0.00	4.76464	0.0261	-1.5829	0.041
79	Shrub	<i>Melastoma malabathricum</i>	198	10	10	19.8	100	2.39	2.50	0.02	4.91090	0.0250	-1.6022	0.040
80	Tree	<i>Betula alnoides</i>	5	1	10	0.5	10	0.24	0.06	0.02	0.32354	0.0006	-3.1999	0.002
81	Tree	<i>Artocarpus lakoocha</i>	3	1	10	0.3	10	0.24	0.04	0.15	0.42745	0.0004	-3.4217	0.001
82	Tree	<i>Mesua ferrea</i>	4	1	10	0.4	10	0.24	0.05	0.15	0.43554	0.0005	-3.2968	0.002
83	Tree	<i>Michelia sp</i>	7	1	10	0.7	10	0.24	0.09	0.36	0.68331	0.0009	-3.0537	0.003
84	Tree	<i>Terminalia myriocarpa</i>	9	2	10	0.9	20	0.48	0.11	0.11	0.70412	0.0011	-2.9446	0.003
85	Tree	<i>Pterospermum acerifolium</i>	12	1	10	1.2	10	0.24	0.15	0.41	0.79954	0.0015	-2.8197	0.004
86	Tree	<i>Bischofia javanica</i>	17	2	10	1.7	20	0.48	0.21	0.17	0.85837	0.0021	-2.6684	0.006
87	Tree	<i>Anthocephalus chinensis</i>	8	1	10	0.8	10	0.24	0.10	0.59	0.92485	0.0010	-2.9957	0.003
88	Tree	<i>Kurrimia robusta</i>	12	1	10	1.2	10	0.24	0.15	0.53	0.92486	0.0015	-2.8197	0.004



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S. No.	Type	Name of the Plant	Circumference (cm)	Radius (R) in cm	R2 in cm <sup>2</sup>	Basal Area (JR2) in cm <sup>2</sup>	Basal Area x No. of plants	Relative dominance	Q-1 (PC)	Q-2 (PC)	Q-3 (TP)	Q-4 (TP)	Q-5 (K)	Q-6 (K)	Q-7 (K)	Q-8 (K)	Q-9 (E)	Q-10 (E)	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
89	Tree	<i>Shorea robusta</i>	450	71.61	5128.06	16110.30	144992.68	0.79308											
90	Tree	<i>Arisaema rhizomatium</i>	310	49.33	2433.61	7645.43	122326.88	0.66910					9					7	
91	Tree	<i>Sterculia villosa</i>	430	68.43	4682.36	14710.09	191231.22	1.04599											13
92	Tree	<i>Terminalia chebula</i>	300	47.74	2279.14	7160.13	136042.51	0.74412							8	11			
93	Tree	<i>Azadirachta indica</i>	210	33.42	1116.78	3508.46	129813.20	0.71005	27		3								7
94	Tree	<i>Lagerstromia speciosa</i>	510	81.16	6586.70	20692.78	372470.08	2.03733									13	5	
95	Tree	<i>Altingia excelsa</i>	350	55.70	3102.16	9745.74	428812.37	2.34551								23	21		
96	Tree	<i>Bombax ceiba</i>	210	33.42	1116.78	3508.46	329795.69	1.80391		89				5					
97	Tree	<i>Astonia scholaris</i>	740	117.76	13867.27	43565.43	653481.40	3.57440	15										
98	Tree	<i>Acer sp.</i>	347	55.22	3049.20	9579.38	498127.86	2.72465			5		36					11	
99	Tree	<i>Gmelina arborea</i>	530	84.34	7113.44	22347.57	916250.30	5.01168	35										6
100	Tree	<i>Albizia lucida</i>	455	72.41	5242.64	16470.29	905866.12	4.95488		23									
101	Tree	<i>Albizia procera</i>	540	85.93	7384.40	23198.83	1159941.43	6.34462	29	21									
102	Tree	<i>Magnolia sp.</i>	410	65.25	4256.92	13373.54	1016388.73	5.55942			4		11	20	21	20			
103	Tree	<i>Toona ciliata</i>	490	77.98	6080.23	19101.64	1279810.00	7.00027							7	6			
104	Tree	<i>Duabanga grandiflora</i>	340	54.11	2927.42	9196.79	1112811.85	6.08683		27	2		40	38					14
105	Tree	<i>Dalbergia sissoo</i>	370	58.88	3466.82	10891.36	1328745.52	7.26794	51		5			10	34	22			
106	Tree	<i>Ficus glomerata</i>	890	141.63	20058.93	63017.12	1701462.23	9.30661										10	17
107	Tree	<i>Dipterocarpus sp</i>	530	84.34	7113.44	22347.57	1609024.92	8.80100								6	13	17	19
108	Liana	<i>Bauhinia vahlii</i>	450	71.61	5128.06	16110.30	1578809.16	8.63573	13	26	4		35	20					
109	Tree	<i>Artocarpus chaplasi</i>	531	84.50	7140.30	22431.98	1816990.25	9.93852	5				5	8	17	19	15		12
							<b>17943840.47</b>	<b>98.149</b>											

Note: PC - Punjabi Camp; TP - Takla Pahar; K - Kronli; E - Etalin

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S. No.	Type	Name of the Plant	Total No. of Individuals	Quadrate of occurrence	Total No of Quadrate Studied	General Abundance	General Frequency	Relative frequency	Relative Density	Relative dominance	Importance Value Index	ni/N	Log(ni/N)	Shannon Index (H) = - (ni/N) x log(ni/N)
			17	18	19	20	21	22	23	24	25	26	27	28
89	Tree	<i>Shorea robusta</i>	9	1	10	0.9	10	0.24	0.11	0.79	1.14535	0.0011	-2.9446	0.003
90	Tree	<i>Arisaema rhizomatium</i>	16	2	10	1.6	20	0.48	0.20	0.67	1.34840	0.0020	-2.6947	0.005
91	Tree	<i>Sterculia villosa</i>	13	1	10	1.3	10	0.24	0.16	1.05	1.44875	0.0016	-2.7849	0.005
92	Tree	<i>Terminalia chebula</i>	19	2	10	1.9	20	0.48	0.24	0.74	1.46129	0.0024	-2.6201	0.006
93	Tree	<i>Azadirachta indica</i>	37	3	10	3.7	30	0.72	0.47	0.71	1.89309	0.0047	-2.3306	0.011
94	Tree	<i>Lagerstromia speciosa</i>	18	2	10	1.8	20	0.48	0.23	2.04	2.74187	0.0023	-2.6436	0.006
95	Tree	<i>Altingia excelsa</i>	44	2	10	4.4	20	0.48	0.56	2.35	3.37825	0.0056	-2.2554	0.013
96	Tree	<i>Bombax ceiba</i>	94	2	10	9.4	20	0.48	1.19	1.80	3.46780	0.0119	-1.9257	0.023
97	Tree	<i>Astonia scholaris</i>	15	1	10	1.5	10	0.24	0.19	3.57	4.00240	0.0019	-2.7227	0.005
98	Tree	<i>Acer sp.</i>	52	3	10	5.2	30	0.72	0.66	2.72	4.09704	0.0066	-2.1828	0.014
99	Tree	<i>Gmelina arborea</i>	41	2	10	4.1	20	0.48	0.52	5.01	6.00655	0.0052	-2.2861	0.012
100	Tree	<i>Albizia lucida</i>	55	2	10	5.5	20	0.48	0.69	4.95	6.12648	0.0069	-2.1585	0.015
101	Tree	<i>Albizia procera</i>	50	2	10	5	20	0.48	0.63	6.34	7.45310	0.0063	-2.1999	0.014
102	Tree	<i>Magnolia sp.</i>	76	5	10	7.6	50	1.19	0.96	5.56	7.71209	0.0096	-2.0180	0.019
103	Tree	<i>Toona ciliata</i>	67	4	10	6.7	40	0.95	0.85	7.00	8.80067	0.0085	-2.0728	0.018
104	Tree	<i>Duabanga grandiflora</i>	121	5	10	12.1	50	1.19	1.53	6.09	8.80754	0.0153	-1.8160	0.028
105	Tree	<i>Dalbergia sissoo</i>	122	5	10	12.2	50	1.19	1.54	7.27	10.00127	0.0154	-1.8125	0.028
106	Tree	<i>Ficus glomerata</i>	27	2	10	2.7	20	0.48	0.34	9.31	10.12476	0.0034	-2.4675	0.008
107	Tree	<i>Dipterocarpus sp</i>	72	5	10	7.2	50	1.19	0.91	8.80	10.90318	0.0091	-2.0415	0.019
108	Liana	<i>Bauhinia vahlii</i>	98	5	10	9.8	50	1.19	1.24	8.64	11.06611	0.0124	-1.9076	0.024
109	Tree	<i>Artocarpus chaplasi</i>	81	7	10	8.1	70	1.67	1.02	9.94	12.63164	0.0102	-1.9903	0.020
			<b>7447</b>	<b>385</b>				<b>91.89</b>	<b>94.00</b>	<b>98.15</b>	<b>284.03822</b>			<b>1.678</b>

Note: PC - Punjabi Camp; TP - Takla Pahar; K - Kronli; E - Etalin



## **4.2 Fauna**

The entire land of the proposed Dibang valley multipurpose project has fairly rich forest cover. The animal habitat is concentrated on lower slopes and terraces edging to major river system. The animals also adapted according to the riverine environment. Many arthropods such as Coleopterans, arachnids and insects were observed. However, due to the short span of time of the EIA study it was not possible for a detailed survey of the lower animals. The surveyed data were recorded as per the following list of fauna.

<i>Mammals:</i>	<i>43 no. of species</i>
<i>Avifauna:</i>	<i>93 no. of species</i>
<i>Reptiles:</i>	<i>20 no. of species</i>
<i>Lizards:</i>	<i>9 no. of species</i>
<i>Amphibians:</i>	<i>10 no. of species</i>
<i>Fishes:</i>	<i>71 no. of species</i>
<i>Butterfly:</i>	<i>2. no. of species</i>
<i>Zooplankton</i>	<i>11 no. of species</i>
<i>Phytoplanktons:</i>	<i>22 no. of species</i>
<i>Benthos:</i>	<i>11 no. of species</i>

The details of fauna found in the survey of Dibang Catchment is presented below:

### **Mammals**

The catchment of the proposed Dibang valley multipurpose project is the major habitat of scheduled species and IUCN red data book recorded species. But due to the wide range of free habitat and less human pressure area they can move freely. All the listed mammals were not sighted during the field survey. However, they have been enlisted in the report based on secondary data available.. Indian Bison, Red panda, Mishimi takin, Serrow, Snow leopard, Musk deer, Himalayan black bear are high altitude animals whereas different tiger sp., Sambar, Felis sp., different macaques, Gibbons, Langurs, Civets, Wild boar, Squirrels, linsang, Mongooses were directly sighted in the catchment area of the project. In the catchment area sambar was found in remarkable numbers.

Table 4.8: List of Mammals

S. No.	Zoological Name	Common Name	IWLP Status, 1972	IUCN Status
1.	<i>Ailurus fulgens</i>	Red panda	Schedule-I	EN
2.	<i>Anonyx cinerea</i>	Clawless Otter	Schedule-I	NA
3.	<i>Bos frontalis</i>	Mithun	NA	VU
4.	<i>Bos gaurus</i>	Gaur	Schedule-I	NA
5.	<i>Budorcas taxicolor</i>	Mishmi takin	Schedule-I	VU
6.	<i>Bunopithecus hoolock</i>	Hoolock gibbon	Schedule-I	EN
7.	<i>Callosciurus pygerrhus</i>	Hoary bellied Himalayan Squirrel	Schedule-II	VU
8.	<i>Canis aureus</i>	Jackal	Schedule-II	NA
9.	<i>Capricornis sumatraensis</i>	Serow	Schedule-I	VU
10.	<i>Cervus unicolor</i>	Sambar	Schedule-III	NA
11.	<i>Cuon alpinus</i>	Wild Dog	Schedule-II	EN
12.	<i>Elephas maximus</i>	Indian Elephant	Schedule-I	NA
13.	<i>Felis bengalensis</i>	Leopard Cat	Schedule -I	NA
14.	<i>Felis chaus</i>	Jungle cat	Schedule-II	NA
15.	<i>Felis viverrina</i>	Fishing cat	Schedule-II	NA
16.	<i>Funambulus palmarum</i>	Three-striped palm squirrel	Schedule-II	LR/nt
17.	<i>Harpestes edwardsi</i>	Common mongoose	Schedule-IV	NA
18.	<i>Hemitragus jemlahicus</i>	Himalayan tahr	Schedule-I	VU
19.	<i>Hylopetes alboniger</i>	Particoloured	Schedule-I	EN

		squirrel		
20.	<i>Lutra perspicillata</i>	Smooth Otter	Schedule-II	NA
21.	<i>Macacca arctoides</i>	Stump tailed macaque	Schedule-II	VU
22.	<i>Macacca assamensis</i>	Assamese macaque	Schedule-II	VU
23.	<i>Macacca lionia</i>	Pig tailed macaque	Schedule-II	NA
24.	<i>Macacca mulata</i>	Rhesus macaque	Schedule-II	LR/nt
25.	<i>Malogate personata</i>	Burmese ferret Badger	Schedule-II	Th
26.	<i>Manis causicaudata</i>	Indian pangolin	Schedule-I	LR/nt
27.	<i>Moschus moschiferus</i>	Musk deer	Schedule-I	VU
28.	<i>Muntiacus muntjak</i>	Barking deer	Schedule-III	NA
29.	<i>Nemorhaedus goral</i>	Goral	Schedule-III	LR/nt
30.	<i>Neofelis nebulosa</i>	Clouded leopard	Schedule-I	VU
31.	<i>Nycticebus coveang</i>	Slow loris	Schedule-I	DD
32.	<i>Paguma larvata</i>	Palm Civet	Schedule-I	NA
33.	<i>Panthera pardus</i>	Leopard	Schedule-I	NA
34.	<i>Panthera tigris</i>	Tiger	Schedule-I	EN
35.	<i>Panthera uncia</i>	Snow leopard	Schedule-I	EN
36.	<i>Prinodon pardicolor</i>	Spotted Linsang	Schedule-I	NA
37.	<i>Salenarctos thibetanus</i>	Himalayan black bear	Schedule-II	VU
38.	<i>Sus scrofa</i>	Wild boar	Schedule-III	NA
39.	<i>Trachypithecus pileatus</i>	Capped langur	Schedule-I	EN
40.	<i>Vivera zibetha</i>	Large Indian	Schedule-II	NA

		civet		
41.	<i>Vivericula indica</i>	Small Indian civet	Schedule-II	NA

[EN - Endangered, VU - Vulnarable, LR/nt - Low risk near threatened, Th - Threatened, NT - Near threatened, NA - Not available]

**Avi Fauna:**

The project catchment area and its surroundings are quite rich in avifauna. In Arunachal Pradesh a large no of avifauna were recorded by Power and Birans (2001) in lower altitude as well as middle ranges of Dibang valley. Out of 93 no of avifauna, only one species is recorded in IUCN red data book i.e Rofus naked hornbill and most of the others fall in schedule IV of the Wildlife (Protection) Act, 1972. Most of the birds are migratory in nature and generally migrate to the nearby sanctuary or different altitudinal areas depending upon the food availability and breeding habitat. Water birds are not very common in the area probably due to the swift running water. With the damming of the river the reservoir banks will have wet environment through out the year, which can lead to proliferation of vegetation e.g grass and aquatic insects along the reservoir banks. It is expected that the whole catchment area will become birds' paradise if authority takes proper measure to check hunting, poaching etc.

**Table 4.9 List of Avi Fauna**

<b>Sl. No.</b>	<b><u>Zoological name</u></b>	<b><u>Common name</u></b>	<b><u>IWLP status 1972</u></b>	<b><u>IUCN Status</u></b>
1.	<i>Aborphila torquela</i>	Hill partridge	Schedule-IV	NA
2.	<i>Ithanginis cruentus tibetanus</i>	Blood pheasant	Schedule-I	NA
3.	<i>Lophophorus impejenus</i>	Monal pheasant	Schedule-I	NA

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4.	<i>Polyplectron bicalcaratum</i>	Peacock pheasant	Schedule-I	NA
5.	<i>Tragopan satrya</i>	Satyr tragopan	Schedule-I	NT
6.	<i>Tragopan temminickii</i>	Temminick's tragopan	Schedule-I	NA
7.	<i>Ceryle ligubris</i>	Himalayan pied Kingfisher	Schedule-IV	NA
8.	<i>Cissa chinensis</i>	Green magpie	Schedule-IV	NA
9.	<i>Oriolus oriolus</i>	Common oriole	Schedule-IV	NA
10.	<i>Oriolus chinensis</i>	Black napped oriole	Schedule-IV	NA
11.	<i>Passer domesticus</i>	House sparrow	NA	NA
12.	<i>Corvus splendens</i>	Crow	Schedule-V	NA
13.	<i>Aceros nipalensis</i>	Rofus naked hornbill	Schedule-I	VU
14.	<i>Buceeros bicorrus</i>	Great pied hornbill	NA	NA
15.	<i>Aceros undulatus</i>	Wrethed hornbill	Schedule-I	NA
16.	<i>Anthraceros albirostris</i>	Oriental pied hornbill	NA	NA
17.	<i>Anorrhincus tickelli</i>	Brown pied hornbill	Schedule-I	NT
18.	<i>G. radiatum</i>	Jungle owlet	Schedule-IV	NA
19.	<i>G. curculoides</i>	Asian barred owlet	Schedule-IV	NA

20.	<i>G. brodiei</i>	Collard owlet	Schedule-IV	NA
21.	<i>Strix aluco</i>	Tawny owlet	Schedule-IV	NA
22.	<i>A. rofogularis</i>	Chestnut breasted Partridge	Schedule-IV	NA
23.	<i>Aythya fuligula</i>	Tufted duck	Schedule-IV	NA
24.	<i>Dendrocopos canicapillus</i>	Grey caped pigmy Wood packer	Schedule-IV	NA
25.	<i>D.macei</i>	Fulvus breasted Wood packer	Schedule-IV	NA
26.	<i>D. cathpharius</i>	Common breasted Wood packer	Schedule-IV	NA
27.	<i>Celus brachyurus</i>	Rofus wood packer	Schedule-IV	NA
28.	<i>Picus chlorophus</i>	Lesser yellow nape	Schedule-IV	NA
29.	<i>P. flavinucha</i>	Greater yellow nape	Schedule-IV	NA
30.	<i>P. canus</i>	Grey headed Wood packer	Schedule-IV	NA
31.	<i>Magalima virens</i>	Great barbet	Schedule-IV	NA
32.	<i>M.franklinu</i>	Golden throated Barbet	Schedule-IV	NA
33.	<i>M. asiatica</i>	Blue throated Barbet	Schedule-IV	NA
34.	<i>M. australis</i>	Blue eared barbet	Schedule-IV	NA
35.	<i>Corcias benghalensis</i>	Indian roller	Schedule-IV	NA
36.	<i>Alcedo hercules</i>	Common kingfisher	Schedule-IV	NA

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37.	<i>A. meninting</i>	Blue eared kingfisher	Schedule-IV	NA
38.	<i>Halycon capensis</i>	Stork killed kingfisher	Schedule-IV	NA
39.	<i>H.coromanda</i>	Ruddy kingfisher	Schedule-IV	NA
40.	<i>Megaceryle lugubris</i>	Crested kingfisher	Schedule-IV	NA
41.	<i>Hierococyx sparverioides</i>	Large hawk cuckoo	Schedule-IV	NA
42.	<i>Psittacula finschi</i>	Grey headed parakeet	Schedule-IV	NA
43.	<i>Collocalia brevirostris</i>	Himalayan swiftlet	NA	NA
44.	<i>Otus silocephalus</i>	Mountain scops owl	Schedule-IV	NA
45.	<i>Caprimulgus macrurus</i>	Large tailed knightjar	Schedule-IV	NA
46.	<i>Dacula badia</i>	Mountain imperial pigeon	Schedule-IV	NA
47.	<i>Teron pompedora</i>	Pin tailed green pigeon	Schedule-IV	NA
48.	<i>G. cuculoides</i>	Asian barred owlet	Schedule-IV	NA
49.	<i>Streptopelia orientalis</i>	Oriental turtle dove	Schedule-IV	NA
50.	<i>Treron sphenura</i>	Wedge tailed green pigeon	Schedule-IV	NA
51.	<i>Ictinaetus malayensis</i>	Black eagle	Schedule-IV	NA

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52.	<i>Microhierax melanoleucos</i>	pied falconet	Schedule-IV	NA
53.	<i>Falecocorax carbo</i>	Great cormorant	Schedule-IV	NA
54.	<i>Pasarisomus delhousiae</i>	Long tailed board Bill	NA	NA
55.	<i>Chloropsis hardwickii</i>	Orange bellied leaf Bird	Schedule-IV	NA
56.	<i>Lanius cristatus</i>	Brown shrike	NA	NA
57.	<i>L. tephronotus</i>	Grey backed shrike	NA	NA
58.	<i>Dendrocitta vagabunda</i>	Rofus tree pie	Schedule-IV	NA
59.	<i>Coracina macei</i>	Large cuckoo shrike	NA	NA
60.	<i>Pericroctus brevirostris</i>	Short billed minivet	Schedule-IV	NA
61.	<i>Hemipus picatus</i>	Bar wing flying catcher	NA	NA
62.	<i>Rhapidura albicollis</i>	White throated fanter	Schedule-IV	NA
63.	<i>Dicrurus hottentotus</i>	Spangled drongo	Schedule-IV	NA
64.	<i>Terpisiphone paradisi</i>	Asian paradise Flycatcher	Schedule-IV	NA
65.	<i>Myoiphorus caeruleus</i>	Blue whistling thrash	Schedule-IV	NA
66.	<i>Ficedula westermanni</i>	Little pied fly catcher	Schedule-IV	NA



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67.	<i>Niltava grandis</i>	Large niltava	Schedule-IV	NA
68.	<i>Muscicapella hodgsoni</i>	Pigmy blue flycatcher	Schedule-IV	NA
69.	<i>Culicicapella ceylonensis</i>	Grey headed canary Flycatcher	Schedule-IV	NA
70.	<i>Enicurus scouleri</i>	Little forktail	Schedule-IV	NA
71.	<i>Sexicola farrea</i>	Grey bushchat	Schedule-IV	NA
72.	<i>Gracula religiosa</i>	Hill mayna	Schedule-IV	NA
73.	<i>Melanochlora sultana</i>	Sultan tit	Schedule-IV	NA
74.	<i>Pycnonotus cafer</i>	Red vented bulbul	Schedule-IV	NA
75.	<i>Alophoxius flaveolus</i>	White throated bulbul	Schedule-IV	NA
76.	<i>Hemixos flavala</i>	Ashy bulbul	Schedule-IV	NA
77.	<i>Hypsipetes macclellandii</i>	Mountrain bulbul	Schedule-IV	NA
78.	<i>H. leucocephalus</i>	Black bulbul	Schedule-IV	NA
79.	<i>Testea olivea</i>	Staly ballied testia	Schedule-IV	NA
80.	<i>Phylloscopus cantator</i>	Yellow vented wrabler	Schedule-IV	NA
81.	<i>Sericercus xanthoschistos</i>	Grey headed	Schedule-IV	NA
82.	<i>S. affinis</i>	White spectacled Bulbul	Schedule-IV	NA

83.	<i>Garulus leucolophius</i>	White crested loughing thrush	Schedule-IV	NA
84.	<i>G. moniledger</i>	Lesser naclaced loughing thrush	Schedule-IV	NA
85.	<i>G. pectoralis</i>	Greater nacklaced loughing thrush	Schedule-IV	NA
86.	<i>Yuhina castaniceps</i>	Striated yuhina	Schedule-IV	NA
87.	<i>Y. zanthleuca</i>	White bellied yuhina	Schedule-IV	NA
88.	<i>Aethpyga nipalensis</i>	Green tailed sunbird	Schedule-IV	NA
89.	<i>Arachnothera longirostrata</i>	Little spider hunter	Schedule-IV	NA
90.	<i>A. magna</i>	Striated spider hunter	Schedule-IV	NA
91.	<i>Motacilla alba</i>	White wagtail	Schedule-IV	NA
92.	<i>Anthus hodgsoni</i>	Olive backed pipit	Schedule-IV	NA
93.	<i>Lonchura striata</i>	White rumped munla	Schedule-IV	NA

[EN-Endangered, VU-Vulnarable, LR/nt- Low risk near threatened, Th-Threatened, NT- Near threatened, NA- Not available]

### **Snakes and other Reptiles**

There are 20 no of snakes recorded in the area whereas only 3 no of species of snaked are found in the submergence area i.e Banded krait (*Bangarus fasciatus*), Python (*Python molurus*), Water snake (*Xenochrophis piscicator*). Most of the snakes are found in the higher altitudinal area. Among the 9 species of lizards Spackled little sunkink (*Mabuya macularia macularia*), Common Asian monitor (*Varanus benglensis*), Calotes (*Calotes versicolor*)

were mostly found in the submergence area .Others species were detected only in the high altitude area of nearby stream or thick forests.

**Table 4.10: List of Snakes and other Reptiles**

<b>Sl. No.</b>	<b><u>Zoological name</u></b>	<b><u>Common name</u></b>	<b><u>IWLP status</u></b> <b><u>1972</u></b>	<b><u>IUCN</u></b> <b><u>Status</u></b>
1.	<i>Bangarus fasciatus</i>	Banded Krait	Schedule-IV	NA
2.	<i>B. ceruleus</i>	Common Krait	Schedule-IV	NA
3.	<i>Ophiophagus acula</i>	King Cobra	Schedule-II	NA
4.	<i>Python molurus</i>	Python	Schedule-I	LR/nt
5.	<i>Naja hanah</i>	King Cobra	Schedule-II	NA
6.	<i>Python aculates</i>	Python	Schedule-I	NA
7.	<i>Xenochrophis piscator</i>	Water snake	Schedule-II	NA
8.	<i>Enhydriis seiboldi</i>	Banded water snake	Schedule-II	NA
9.	<i>Amphiesma modesta</i>	Mountain keelback	Schedule-II	NA
10.	<i>A. stolata</i>	Buff striped keelback	Schedule-II	NA
11.	<i>Ahectwa prasinus</i>	North east vine snake	Schedule-II	NA
12.	<i>Boija ocellata</i>	Eyed cat snake	Schedule-II	NA
13.	<i>Coelognathus radiatus</i>	Tinket snake	Schedule-II	NA

14.	<i>Dendrelaphis cyanochloris</i>	Green bronzeback	Schedule-II	NA
15.	<i>Gongylosoma prasinnuo</i>	Green tinket snake	Schedule-II	NA
16.	<i>Bangarus niger</i>	Black krait	Schedule-II	NA
17.	<i>Naja kaothia</i>	Monocled cobra	Schedule-II	NA
18.	<i>Sinomicrurus maccllandii</i>	Coral snake	Schedule-II	NA
19.	<i>Trimeresurus medoensis</i>	Medo pit viper	Schedule-II	NA
20.	<i>T. yunanensis</i>	Yunamen pit viper	Schedule-II	NA

[ LR/nt- Low risk near threatened, NA- Not available]

## LIZARDS

**Table 4.11: List of Lizards**

<u>Sl. No.</u>	<u>Zoological name</u>	<u>Common name</u>	<u>IWLP status 1972</u>	<u>IUCN Status</u>
1.	<i>Ptyctoemus gularis</i>	Blue throated Forest lizard	NA	NA
2	<i>Hamidactylus frenatus</i>	Spiny tailed House Gecko	NA	NA
3.	<i>Geckoo gecko</i>	Tockay	NA	NA
4.	<i>Cosymbotus playtyurus</i>	Asian flat tailed gecko	NA	NA

5.	<i>Sphenomorphus aculates</i>	Stream side forest Skink	NA	NA
6.	<i>Mabuya macularia</i> <i>macularia</i>	Spackled little Sun kink	NA	NA
7.	<i>Varanus begalensis</i>	Common Asian Monitor	Schedule-II	NA
8.	<i>Calotes versicolor</i>	Common calotes	NA	NA
9.	<i>Draco aculates</i>	Spotted dracoo	NA	NA

### **Amphibians**

In case of amphibian fauna common oriental toad (*Bufo melanostictus*) Amolops Formosa, Asian cricket frogs (*Limnocharis limnocharis*), were found in the stream side of the submergence area.

**Table 4.12: List of Amphibians**

<b><u>Sl. No.</u></b>	<b><u>Zoological name</u></b>	<b><u>Common name</u></b>	<b><u>IWLP status 1972</u></b>	<b><u>IUCN Status</u></b>
1.	<i>Xanophris robusta</i>	Large xanophris	NA	DD
2.	<i>Bufo Himalayan</i>	Himalayan toad	NA	NA
3.	<i>B. melanostictus</i>	Common oriental toad	NA	NA
4.	<i>Amolops formosus</i>	Long fingered amolops	NA	NA
5.	<i>Euphlyctis cyanophlyctis</i>	Asian skitterer	NA	NA

6.	<i>Limnonectes limnocharis</i>	Asian cricket frog	NA	NA
7.	<i>Rachophorus maximus</i>	Large green rachophorus	NA	NA
8.	<i>Theلودerma asparum</i>	Pied theلودerma	NA	NA
9.	<i>Philautus andersoni</i>	Tuberculata philautus	NA	NA
10.	<i>P. namdaphensis</i>	Namdapha philautus	NA	NA

[DD - Data deficient, NA - Not available]

### **Fishes**

There are three categories of fish species based on their occurrence viz.-

- A. Upper reaches: Cold temperature zone 1200 -1400 m.
- B. Middle reaches: Subtropical zone 800 -1200 m.
- C. Lower reaches: warm tropical zone bellow 800 m.

The catchment area of Dibang river of Dibang Multipurpose Project covers the middle reaches and lower reaches zone. The observed species in the dam site are *Schizothorax richardsoni*, *Tor putitora*, *Tor tor*, *Neolissolichlus hexagonolepis*, *Chagunus chagunio*. Other mentioned common species are found mostly in lower stream that is up to Kundil which are not migratory in nature. In the upstream of the catchment area except *Chagunus chagunio* and *Gara* species no other species were found, probably due to the seasonal behavior.

**Table 4.13: List of Fishes**

<u>Sl. No.</u>	<u>Zoological name</u>	<u>Common name</u>	<u>NBFRG Status</u>	<u>IUCN Status</u>
1.	<i>Anguila bengalensis</i>	Eel/Nodal bami	VU	NA

2.	<i>Notopterus notopterus</i>	Kandhuli	LR/nt	NA
3.	<i>Schizothorax richardsonii</i>	Snow trout	ID	NA
4.	<i>Aspidoparia morar</i>	Boriola	LR/nt	NA
5.	<i>Barilius bandelensis</i>	Korang	NE	NA
6.	<i>B. shakra</i>	Koksa	LR/nt	NA
7.	<i>B. vagra</i>	Korang	VU	NA
8.	<i>B. bola</i>	Raja (korang)	VU	NA
9.	<i>B. tileo</i>	Tilei/Sellen	LR/nt	NA
10.	<i>B. barna</i>	Ozala	LR/nt	NA
11.	<i>Danio aequipinnatus</i>	Sal danikona	NE	NA
12.	<i>D.danglia</i>	Laupati	NE	NA
13.	<i>Tor putitora</i>	Jungapithia	VU	NA
14.	<i>Tor tor</i>	Bokapithia	ID	NA
15.	<i>Neolissiocheillus hexagonolepis</i>	Copper mahasheer	NE	NA
16.	<i>Chagunius chagunio</i>	Patharchatti	ID	NA
17.	<i>Puntias chola</i>	Puthi	VU	NA

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18.	<i>P.chonconius</i>	Puthi	VU	NA
19.	<i>P. ticto</i>	Puthi	LR/nt	NA
20.	<i>P. sarana sarana</i>	Cheniputhi	VU	NA
21.	<i>Labeo calbasu</i>	Calbasu	LR/nt	NA
22.	<i>L. dero</i>	Bato	VU	NA
23.	<i>L. pangusia</i>	Sheelgharia	ID	NA
24.	<i>Crossocheilus latius latius</i>	Lurali	ID	NA
25.	<i>Garra annadalei</i>	Garra	NE	NA
26.	<i>Garra gotyla gotyla</i>	Garra/Gharporia	NE	NA
26.	<i>Psilorhynchus balitora</i>	Balitora	VU	NA
27.	<i>Neomachilus rupecola</i>		ID	NA
28.	<i>N. arunachalensis</i>		NE	NA
29.	<i>Oreochthys casuotis</i>	Koswati	NE	NA
30.	<i>Acanthocobotis botia</i>	Botia	NE	NA
31.	<i>Lepidocephalus . guntea</i>	Botia	NF	NA
32.	<i>Mystus vitatus</i>	Singara	VU	NA
33.	<i>Ompok bimaculatus</i>	Pabda	VU	NA



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34.	<i>O. pabda</i>	Pabda	EN	NA
35.	<i>Wallagu atu</i>	Barali	NF	NA
37.	<i>Amblyceps apangi</i>		NF	NA
38.	<i>Bagarius bagarius</i>	Garua	VU	NA
39.	<i>Glyptothorax pectinopterus</i>		NF	NA
40.	<i>Chaca chaca</i>	Chaka	NE	NA
41.	<i>Hara hara</i>	Hara	NE	NA
42.	<i>H. jardonii</i>	Sylhet hara	NE	NA
43.	<i>Olyra longicaudata</i>	Botsinghi	NE	NA
44.	<i>Xentoden cancila</i>	Kokila	LR/nt	NA
45.	<i>Chanda nama</i>	Chanda	NE	NA
46.	<i>Chnda ranga</i>	Chanda	NF	NA
47.	<i>Mustacembelus armatus</i>	Bami	NE	NA
48.	<i>Macrogathus pancalaus</i>	Turi	LR/nt	NA
49.	<i>Badis badis</i>	Randolonee	NE	NA
50.	<i>Channa punctata</i>	Goroi	LR/nt	NA
51.	<i>Channa orientalis</i>	Cheng	VU	NA

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52.	<i>Rasbora dominicus</i>	Dorikona	LR/nt	NA
53.	<i>Monopterus cuchia</i>	Cuchia	LR/nt	NA
54.	<i>Esomus dendricus</i>	Dorikona	LR/lc	NA
55.	<i>H. fossilis</i>	Singhi	NF	NA
56.	<i>Clarius batracus</i>	Magur	VU	NA
57.	<i>Oreochromis mossambica</i>	Japani kaoi	NF	NA
58.	<i>Colisa fasciatus</i>	Khalihana	LR/nt	Na
59.	<i>Amblypharyngodon mola</i>	Moa	LR/lc	NA
60.	<i>Setipinna phasa</i>	Phasa	ID	NA
61.	<i>Gadusia chapra</i>	koroti	LR/lc	NA
62.	<i>Schizothorax esocinus</i>	Chirruh	ID	NA
63.	<i>S. stolickeke</i>		ID	NA
64.	<i>S. progastus</i>	Lohone	ID	NA
65.	<i>Aspidoporia jaya</i>	Boriola	VU	NA
66.	<i>S. semiplotus</i>	Lahoboe	VU	NA
67.	<i>Garra mccllelandi</i>	cauvery garra	EN	NA
68.	<i>B. dario</i>	Kukur Botia	NE	NA

69.	<i>B. rostrata</i>	Botia	NE	NA
70.	<i>Amblyceps mangois</i>	Billi	LR/nt	NA
71.	<i>Chanda baculis</i>	Chanda	NF	NA

[EN - Endangered, VU -Vulnerable, LR/nt - Low risk near threatened, LR/lc - Low risk less concern, Th - Threatened, NT - Near threatened, DD - data deficient, NE - Not evaluated, ID - Indeterminate, NF - Status not found, NA - Not available, NBFGR - National Bureau of Fish Genetic Resources]

### **Migratory Fish Species**

Out of 71 fish species mentioned in table 3.16 five species viz. *Schizothorax richardsonii*, *Tort or*, *Tor putitora*, *Neolissocheilus hexagonolepis* and *Chagunius chagunio* are migatory in nature for breeding purpose. For species viz. *Crossocheilus latius latius*, *Garra annadalei*, *Garra gotyla gotyla* and *Psilorhnhchus balitora* are local migratory for feeding purpose.

High river discharge, fast water currents and want of suitable spawning ground in the lower reaches of the river are the reasons which force the fish to swim upstream in search of suitable eco-system to spawn. Mahaseers attain maturity in the size range from 30-40 cm. The fish lay eggs in sandy/ gravelly pits in the river bed or beneath rocks boulders in shallow waters receiving moderate current at a depth of 40-60 cm and in water sufficiently clean and transparent. Size of putitora mahaseer fry and fingerlings found during the investigation ranged from 18 to 120 mm.

Putitora mahaseer species starts spawning from the onset of south-west monsoon in mid July which continues till the middle of October in flooded river. The peak breeding occurs in August-September in ambient water temperature from 18<sup>0</sup>C to 22<sup>0</sup>C.

The other important migratory species *Tor tor* have a prolonged breeding period commencing from July-August continuing sometimes till November in water temperature 17<sup>0</sup>C - 22<sup>0</sup>C and transparency 20-30 cm. Fish species of

the river belonging to other commercial and miscellaneous groups have usual spawning periods well spread which make them available throughout the year in shallow marginal areas of the river in clear water and steady velocity. Their rate of growth is slow, average sizes vary from 35 to 125 mm.

### **Butterfly**

Dibang valley is a paradise of Butterflies also; so protective measure should be taken with the project. During the monsoon season the butterfly population increases comparably to the other seasons. Most of the population is found nearby water sources. Indian fritillary. Common earls were found enormously in the riverside. In the catchment area only one scheduled species was found i.e. Plain puffin. No IUCN recorded species were found during our survey periods.

**Table 4.14: List of Butterflies**

Sl. No.	<u>Zoological name</u>	<u>Common name</u>	<u>IWLP status 1972</u>	<u>IUCN Status</u>
1.	<i>Pincep memnon agenor*</i>	Great marmond	NA	NA
2.	<i>Prineris clementhe</i>	Spotted sawtooth	NA	NA
3.	<i>Princep paris paris</i>	Paris peacock	NA	NA
4.	<i>Cirrochroa aoris aoris</i>	Large yeoman	NA	NA
5.	<i>Euthelia phemius</i>	White edge blue barron	NA	NA
6.	<i>Tanacecia jullappiades</i>	Common earl	NA	NA
7.	<i>Argyrerus hyperbius</i>	Indian fritillary	NA	NA

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8.	<i>Appias indra shiva</i>	Plain puffin	Schedule-II	NA
9.	<i>Tirumala septentrionis</i>	Dark blue tiger	NA	NA
10.	<i>Graphium cloanthus</i>	Glassy blue bottle	NA	NA
11.	<i>Pinceps xenocoles phrontis</i>	Great Zebra	NA	NA
12.	<i>Appias lyncidaelanora</i>	Chocolate albatross	NA	NA
13.	<i>Spindiaosis lohita</i>	Silver line long Banded	NA	NA
14.	<i>Apatura ambica</i>	Purple emperor	NA	NA
15.	<i>Collias sp</i>	Clouded yellow	Schedule-II	NA
16.	<i>Dercus verhulli</i>	Tailed sulphur	NA	NA
17.	<i>Stibochiona nicea</i>	Popinjay	NA	NA
18.	<i>Ragadia crisilda</i>	Striped ringlet	NA	NA
19.	<i>Mycalesis visala</i>	Long brand bush Brown	NA	NA
20.	<i>Neorina patria</i>	White owl	NA	NA
21.	<i>Hyplolacaena erylus</i>	Common tit	NA	NA

[NA- Not available]

### Phytoplankton, zooplankton and benthos

The rivers and other water bodies have been observed sources of fish food and found a numbers of phytoplanktons, zooplanktons and benthos which are recorded as follows in table 4.14:

**Table 4.15: List of Phytoplanktons, Zooplankton and Benthos**

Phytoplankton	Zooplankton	Benthos
<i>Clamydomonas</i>	<i>Amoeba</i>	<i>Tubifex</i>
<i>Volvox</i>	<i>Trinema</i>	<i>Chironomus</i>
<i>Ulothrix</i>	<i>Paramoecium</i>	<i>Branchiura</i>
<i>Spaherocystis</i>	<i>Brachionus</i>	<i>Chaborus</i>
<i>Spirogyra</i>	<i>Keratella cochlaris</i>	<i>Tanypus helminta</i>
<i>Zygnema</i>	<i>Rotaria</i>	<i>Chaetogasfer</i>
<i>Cladophora</i>	<i>Daphnia</i>	<i>Dero</i>
<i>Oedogonium</i>	<i>Moina</i>	<i>Earthworm</i>
<i>Pediastrum</i>	<i>Cyclops</i>	<i>Lymneae</i>
<i>Ankistrodesmus</i>	<i>Cypris</i>	<i>Gyralus</i>
<i>Closterium</i>	<i>Mesocyclops</i>	<i>Viviparus</i>
<i>Cosmarium</i>		
<i>Oscillatoria</i>		
<i>Phacus sp.</i>		
<i>Cyclotella sp.</i>		
<i>Diatom sp.</i>		
<i>Synedra sp.</i>		
<i>Naricula sp.</i>		
<i>Nostoc</i>		
<i>Spirullina</i>		
<i>Microcystis</i>		
<i>Ceratium</i>		

**Table 4.16: Status Wise No of Fauna According to Wild Life (Protection) Act 1972, Revised Edition 2002**

<u>Class</u>	<u>Schedule-I</u>	<u>Schedule-II</u>	<u>Schedule-III</u>	<u>Schedule-IV</u>	<u>Schedule-V</u>
Mammals	18	13	5	1	Nil
Avifauna	8	Nil	Nil	75	1
Reptiles	2	16	Nil	2	Nil
Lizards	Nil	1	Nil	Nil	Nil
Amphibians	Nil	Nil	Nil	Nil	Nil
Butterflies	Nil	2	Nil	Nil	Nil

**Table 4.17: Status Wise No Of Fauna According To IUCN Red Data Book As Revised 2006 Edition**

<u>Class</u>	<u>EN</u>	<u>VU</u>	<u>LR/nt</u>	<u>TH</u>	<u>NT</u>	<u>DD</u>
Mammals	7	10	4	1	Nil	1
Avifauna	Nil	1	Nil	Nil	2	Nil
Reptiles	Nil	Nil	1	Nil	Nil	Nil
Lizards	Nil	Nil	Nil	Nil	Nil	Nil

Amphibians	Nil	Nil	Nil	Nil	Nil	1
Butterflies	Nil	Nil	Nil	Nil	Nil	Nil

[EN - Endangered, VU - Vulnerable, LR/nt - Low risk near threatened, Th - Threatened, NT - Near threatened, DD - Data deficient]

**Table 4.18: Status wise number of fish according to National Bureau of Fish Genetic Resources 2006**

<b>EN</b>	<b>VU</b>	<b>LR/nt</b>	<b>LR/lc</b>	<b>TH</b>	<b>NT</b>	<b>DD</b>	<b>NE</b>	<b>ID</b>
2	16	17	3	Nil	Nil	Nil	19	10

[EN - Endangered, VU - Vulnerable, LR/nt - Low risk near threatened, LR/lc - Low risk less concern, TH - Threatened, NT - Near threatened, DD - Data deficient, ID - Indeterminate]

No IUCN red data book recorded fish species was found.