

**CHAPTER: II**

**STUDY AREA**

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Located in the foothills of the Eastern Himalaya, Buxa Tiger Reserve (BTR) is blessed naturally a wide range of forest ecosystems. This forest area is inhabited by different groups of tribal communities *viz* Koch, Mech and Rava (Sarkar, 2011). Past glory of this forest is diminishing fast. However, it is important to conserve its forested vegetation for the survival of its cat and elephant populations. This stretch of forest serves as the international route for elephant migration between India and Bhutan. It is also the home for a wide range of wild plants and animal. Buxa National Park is one of the most interesting places in Jalpaiguri – for academic and tourism services.

### 2.1. LOCATION

Geographically BTR is lying between the latitudes of 26° 30' and 26° 55' N and the longitudes of 89° 20' and 89° 55' E. The overall topography of the area is an amalgamation of plains and hills. The mountainous tract is an extension of the outer spurs of the Eastern Himalaya. Also, this is the only tiger reserve located in the northern part of West Bengal. This Protected Area is sharing its boundary with the international border with Bhutan on the North and the eastern boundary touches the Indian state of Assam. Western and Southern boundaries are demarcated by several Tea Estates (T. E.) within the Indian territory.

It is the easternmost extension of extreme bio-diverse Northeast India and represents a part of the highly enriched and diversified IUCN recognized Himalaya Biodiversity Hotspot. The fragile “Terai Eco-System” constitutes a part of this Reserve (Rangini *et al*, 2013; <http://projecttiger.nic.in/buxa.htm>). Phipsu Wildlife Sanctuary of Bhutan lying contiguous on its north and the Manas National Park on the east boundaries.

It is connected with the sub-divisional town (Alipurduar) and block town (Hamiltonganj) by roads. While the forest department maintains some parts of this road, the remaining portion maintained by the Public Works Department of the Government of West Bengal.

### 2.2. DIFFERENT PHYSICAL ATTRIBUTES

#### 2.2.1. Topography

BTR is primarily situated in Bhabar and Terai areas consisting of slightly undulating land. Mountainous with elevation areas observed towards its northern boundary. The elevation ranges from 60 to 1750 m. (Sivakumar & Prakash, 2004). Hilly areas are steep and precipitous.

#### 2.2.2. Geology

BTR lies in the foot hills of the Himalayas. The Management Cum Working Plan of BTR by Das (2000) mentioned that, “At an altitude of 1800 m Himalayan formation of Darjeeling gneiss is observed. The

great boundary fault (Gondwanas) lies on South of it and followed by Shiwalik hills, Bhabar tract and finally ill drained clayey Terai tract.”

### 2.2.3. DRAINAGE:

The area of BTR is intersected by several *nullahs* (streams) and rivers, most of these have been originated in Bhutan. Principal rivers passing through BTR are Rydak, Sankosh, Jainti, Bala and Dima. However, major part of the National Park area lies in between two rivers Jainti and Bala.

### 2.2.4. Soil

The dominant soil textures of BTR are clay loam and sandy loam (Chakrabarti *et al*, 2002). Southern part of the reserve is flat and harboring the major portion of BTR. Soil is uniform throughout consisting of light, friable loam varying in depth (Das, 2000).

### 2.2.5. Archeology

At an altitude of 787 m above m.s.l. the historic Buxa fort is located. This fort is very much attached with country's freedom movement. Several freedom fighters were kept in exile in this fort. The sacred Mahakal temple of Lord Shiva is visited by more than 10,000 devotees every year during *Shiv Chaturdashi* and onwards (<http://projecttiger.nic.in/buxa.htm>).

## 2.3. CLIMATE

Varied topography and elevations generally provides the area with an unique climatic set-up. Physical differences across the reserves are playing great role on the wind movement in its different parts. This also greatly controls the ambient temperature and overall precipitation. Altitudinal variation greatly influence its temperature that controls other factors like wind speed and relative humidity. Alluvium plain and mountainous configuration has put the reserve in the moist tropical zone. This climatic uniqueness makes the reserve into a biologically diverse area. Four distinct climatic seasons are observed in BTR

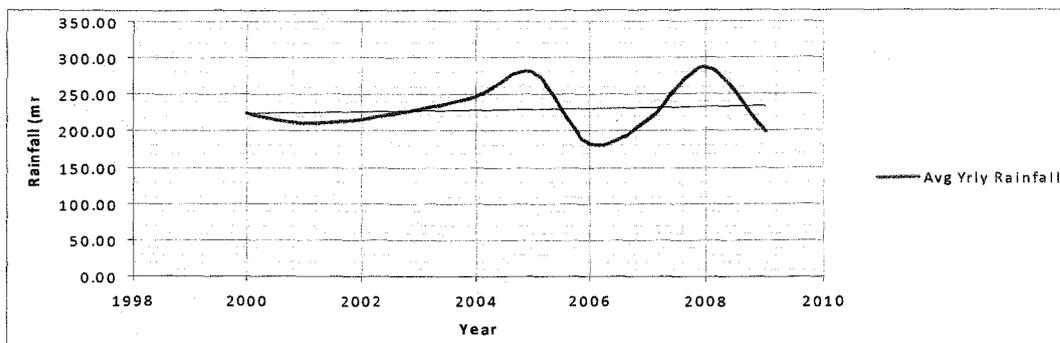
- i) Summer
- ii) Monsoon
- iii) Autumn and
- iv) Winter.

### 2.3.1. Rainfall

South –West monsoon is the primary source of rainfall. June to September is the main period of precipitation. December is the driest season with minimum or no rainfall. However, most of the winter rain receives in March. April to May is the time of hails and thunder with some pre-monsoon precipitation. The average annual rainfall in the reserve is 410 cm (Das, 2000; Sivakumar & Prakash, 2004). Rainfall data has been analyzed in Fig 2.1 and Table 2.1.

### 2.3.2. Temperature

Area is lies in moist tropical zone. Average minimum and maximum temperature varies between 32°C to 12°C (Sivakumar & Prakash, 2004). Highest recorded temperature was 39°C in 1899 and lowest was 2°C in 1887 (Das, 2000). Nights are always cooler, even pleasant in summer. Monthly average temperature during the years 2000 to 2009 has been presented in Table 2.2.



**Fig 2.1.** Average yearly rainfall data during 2000 to 2009

**Table 2.1.** Record of rainfall (in cm) in BTR during 2000 to 2009

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Average / month
2000	0	48	20	259.5	300	719	361	522	384	78	0	0	224.29
2001	0	17	6	86	362.5	719	361	522	384	78	0	0	211.29
2002	26.3	0	124.1	353.9	143	442.5	926	84.5	446.5	39.5	0	0	215.53
2003	0	19	95	225	344.6	689	734	269	112	211.1	0	41	228.31
2004	0	0	16	216	296	444	892	144	656.4	306	0	0	247.53
2005	0.5	3	70	18.7	230.5	816.1	807.6	824	86	504.2	0	0	280.05
2006	0	13	1.3	61.3	282.1	634.1	340.6	141.6	461.7	212	18.2	14	181.66
2007	0	73	12.6	162.2	262.4	636.1	448.6	414.7	437.9	131.8	0	0	214.94
2008	26	4.4	81.5	184.2	290.1	580.6	557.2	1044.8	423.6	239.6	0	3.2	286.27
2009	0	0	25.8	91.1	246.7	770.2	244	519	249.6	250.1	0	0	199.71

**2.3.3. Relative humidity**

Due to its location, the reserve remains humid around the year. Maximum and minimum relative humidity varies between 80 % and 95 % and never observed below 75 %. June to September is most humid and December to February are less humid months. A detail of yearly RH % for the period 2000 to 2009 is given in Table 2.3.

**2.3.4. Wind velocity**

The reserve generally does not face any heavy or strong storm probably due to its locational advantage. However, mild form of storm is an annual feature and causes some damage to the vegetation every year. In 1942 – 43 a heavy cyclone hit the reserve causing enormous damage (Das, 2000).

**2.4. ECOLOGICAL SIGNIFICANCE**

It is located in the confluence of three major Bio-geographic zones (Das, 2000):

- Lower Gangetic plains;
- Central Himalayas; and
- Brahmaputra Valley.

So, it is expected that the biological amalgamation of the area should represent some unique features. So far, there was no such attempt to understand this expected uniqueness of this biozone.

**2.5. Vegetation Type**

**Table 2.2.** Record of monthly minimum and maximum temperature in °C during 2000 to 2009

Year	January		February		March		April		May		June		July		August		September		October		November		December	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
2000	22.7	10	24.4	10.5	28.2	15.8	30.8	20.7	31	22.5	31.6	23.7	31.7	25.2	31.4	25.2	31.1	24	31.6	22.4	27.5	17.1	24.7	10.9
2001	22.8	8.7	25	11.9	30.6	15.1	31.7	20.2	31.2	22.4	31.6	23.7	31.7	25.2	31.4	25.2	34.1	24	31.6	22.4	27.5	17.1	24.7	10.9
2002	23.2	10.7	26.6	11.5	29.3	15.6	28.8	17.6	30.1	21.7	31	24	30.4	24.2	30	22.4	32	23.6	30.8	21.3	28	16.4	24.3	12.6
2003	22.1	8.4	22.5	9.9	27.7	13.6	30.5	19.5	32.1	21.1	33.9	22.6	32.7	24.2	34.4	25.6	34.5	24.5	31.3	21.6	28.9	17.2	25.6	12.6
2004	22.6	9.3	26	11	30.8	17.2	28.5	19.3	31.9	21.3	32.1	22.7	31.3	23	33.9	24.9	32.1	23.6	30.2	19.6	29	14.6	27.2	11.3
2005	23.8	8.5	26.2	13.1	29.3	15.2	31	17.5	30.6	18.7	31.6	22.6	29.5	25.2	32.1	25	33.2	24.8	29.4	20.8	27.9	15.4	25.9	11.6
2006	22.4	10.9	27.2	15.4	30.8	16	30.8	20.5	27.2	22.7	30.9	24.4	32.1	25.6	32.7	25.6	31	24.2	30.9	21.1	26.8	16.5	24.5	12.3
2007	22.1	8.9	23.5	13.2	28.3	15.2	29.6	20.1	32.5	23.2	30.7	24.3	30.5	24.8	32	25.8	30.9	24.5	30.9	22	28.7	16.9	24.6	11.1
2008	24.5	10.6	23.7	10.4	28.4	16.8	30	20.2	31.2	22.2	30.6	24.2	30.9	25.1	30.7	24.6	31.6	24.3	31.2	21.5	28	15.1	24.5	14
2009	23.6	11.6	27.7	13.1	31	15.5	29.3	18	31.6	18.9	32.6	21.8	32.7	24.1	31.5	24.2	33.1	23.6	31.2	20.1	27.8	14.8	24	11.2

**Table 2.3.** Recorded relative humidity (RH %) during 2000 to 2009

Year	Maximum (06:32 hrs.)	Minimum (13:32hrs.)
2000	94.00	79.33
2001	82.48	77.25
2002	89.67	76.92
2003	90.50	75.67
2004	90.08	71.00
2005	90.67	76.08
2006	93.33	75.17
2007	92.67	69.33
2008	92.42	70.83
2009	88.58	73.58

Vegetation of BTR area is broadly classified as tropical moist-deciduous forest with following different sub-types as recognized by Champion & Seth (1968):

- i. Northern dry deciduous seral Sal, Khair, Sissoo, Simul association (5B/1S<sub>2</sub>)
- ii. Eastern Bhabar & Terai Sal (3C/C<sub>1b</sub> & 3C/C<sub>1c</sub>)
- iii. East Himalayan Moist Mixed Deciduous forest (3C/C<sub>3b</sub>)
- iv. Sub-Himalayan secondary Wet Mixed forest (2B/2S<sub>3</sub>)
- v. Eastern Sub-Montane Semi Evergreen forest (2B/C<sub>1b</sub>)
- vi. Northern Tropical Evergreen forest (1B/C<sub>1a</sub>)
- vii. East Himalayan Subtropical Wet Hill Forest (8B/C1); and
- viii. Moist Sal, Savannah (3C/DSI) and Low alluvium savannah woodland (3C/3/1S<sub>1</sub>).

However, core area of BTR consists of mainly two type of forests –

- i. Northern dry deciduous seral Sal, Khair, Sissoo, Simul association (5B/1S<sub>2</sub>); and
- ii. Eastern Bhabar & Terai Sal (3C/C<sub>1b</sub> & 3C/C<sub>1c</sub>).

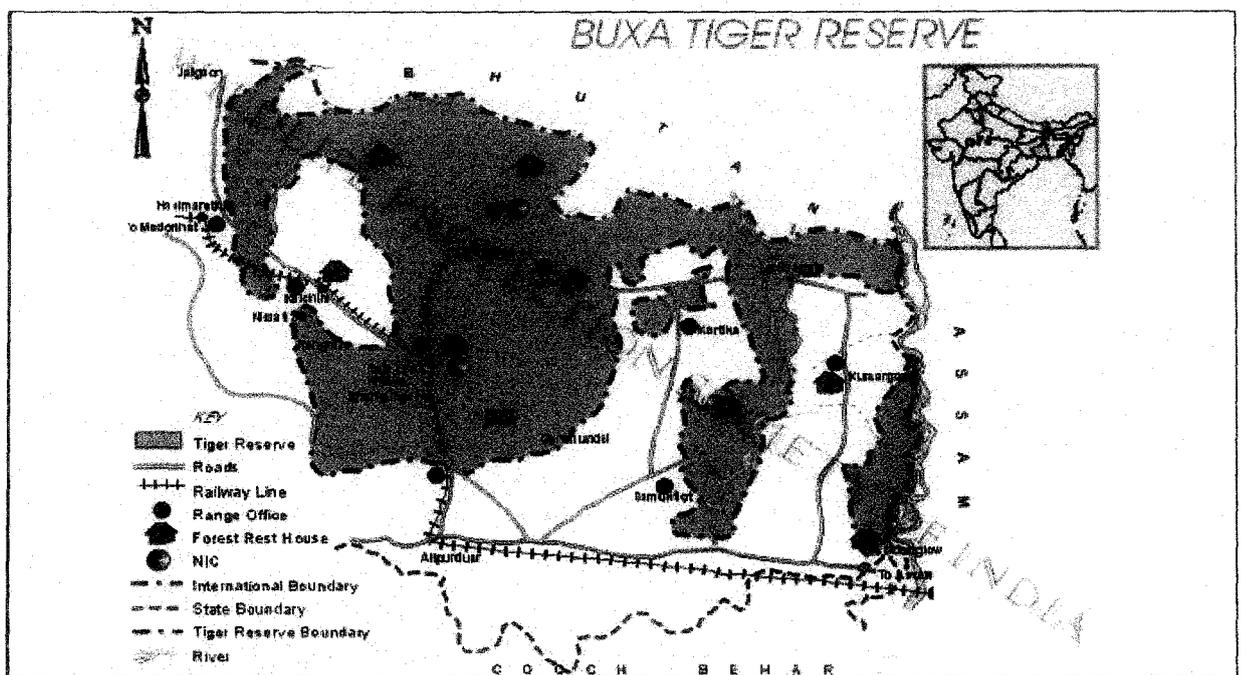


Fig 2.2. Forest area map of Buxa Tiger Reserve [Source: <http://www.wpsi-india.org/tiger/buxa.php>]

## 2.6. BIOLOGICAL RESOURCES

### 2.6.1. Flora

BTR is known to harbor 283 species of trees, 81 species of shrubs and herbs, 33 species of climbers, 150 species of orchids, 36 species of grasses and sedges and 7 species each of canes and bamboos (Pestonjee & Datta, 1999). However, the report of the occurrence of 60 % of endemic species in BTR vegetation by [www.sanctuaryasia.com](http://www.sanctuaryasia.com) is highly doubtful and is disagreeable in all probabilities.

## 2.6.2. Fauna

In terms of faunal diversity, the reserve provides habitat to 67 species of mammals, 230 species of birds, 28 species of fishes, 35 species of reptiles and 4 species of amphibians (Pestonjee & Datta, 1999). Out of these species 21 among the mammals, 7 among the birds and 10 among the reptiles are in the red list of endangered species (<http://projecttiger.nic.in/buxa.htm>).

## 2.7. SETTLEMENTS

National Park area of BTR is commonly known as Jainti forest and inhabited by two human settlements – Jainti village and Bhutia Busty Bengal Line village. People of these villages are completely depend on the forest resources of Jainti forest. Excluding these two settlements, people of Nurpur village also depends on this forest for commercial as well as subsistence purposes.

## 2.8. COMMUNICATION NETWORK

National Highway No. 31C roughly runs along its southern boundary. However, the core area under Jainti Range is 30 km away from Alipurduar town. Nearest railway station is Rajabhatkhwa . It is 15 km away from the study area. Jainti is located around 246 km from the nearest airport Bagdogra which is about 13 km away from Siliguri town (Fig. 2.2).

## 2.9. FOREST HISTORY

Till 1865 this forest area was the property of Coochbehar raja. Bhutan king was then superior in this area and with the request by Coochbehar raja to the East India Company in 1774 a treaty was signed between Bhutan king and the company to control the aggressions of Bhutanese (Das, 2000). But, the permanent settlement was made during 1865 and a treaty between Bhutan king and the British Government had been signed. During 1874-75 Jalpaiguri Forest Division was created and the present Buxa area was a part of

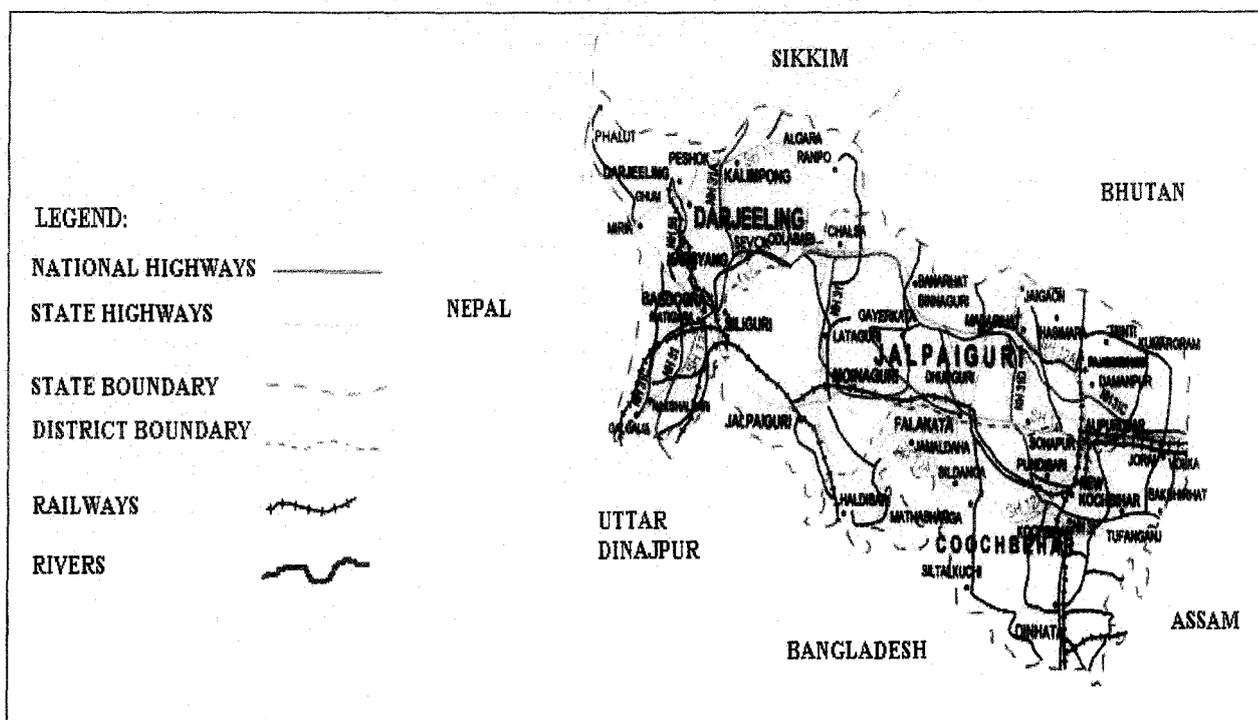


Fig 2.3. Communication network map of Buxa Tiger Reserve [Source: <http://pwdwb.in/images/MAP1.jpg>]

that division. In 1877-'78 Buxa Division was announced and it became a Reserved Forest during 1879. Historical information about the Jainti forests is not available in details but, till 1930 it was a block under Buxa-Duar Range. In 1983 Buxa Tiger Reserve (BTR) has been notified by the National Government and in 1997, 117.10 sq km of Jainti has been declared as a National Park (Das, 2005).

## 2.10. CONSERVATION HISTORY

This area has been under the control of the Forest Department (FD) since 1865 but no management record was available till 1875 when for the first time a scheme for systematic management was prepared by Dr. William Schlich [1874-75 to 1905-06], resulting in the preparation of its First Working Plan (Chaudhury, 2009). Under this Plan *Shorea robusta* over 5ft girth were removed departmentally over 1/8<sup>th</sup> of the Rajabhatkhawa Block annually from 1875-76 to 1882-83. The second working plan [1905-06 to 1919-20] by C.C. Hatt prescribed selection felling followed by natural regeneration (Chaudhury, 2009). Around 1911 it was realized that fellings tended to increase the already dense evergreen undergrowth of these forests. The third Working Plan of Shebbear (1920-21 to 1924-25) prescribed artificial regeneration of clear felled areas by means of *Taungia*<sup>1</sup> plantation because natural regeneration of Sal was known to have failed (Das, 2000). In the fourth working plan of Homfray (1929-30 to 1948-49) felling was made from miscellaneous trees on a 20 years cycle from the wet mixed areas along the edges of the annual coupes to meet the fuel-wood demand (Chaudhury, 2009). Dry Sal felling was done on a 5 years cycle according to a fixed program. This plan also emphasized the need for maintenance and improvement of grasslands. In the 5<sup>th</sup> working plan (1945-46 to 1964-65) two new working circles were created i.e. Sanctuary and Protection Working Circles. All types of extraction including thatch were prohibited in this plan except limited felling of timber trees by departmental agencies. In the 6<sup>th</sup> (1965-66 to 1974-75) and 7<sup>th</sup> (1975-76 to 1984-85) working plan Teak conversion from natural vegetation was done to eradicate herbs and shrubs (Das, 2009). In the sixth working plan a vast area was converted into wet mixed forest to meet the fuel-wood demand of the tea gardens and the supply need of local wood based industries.

Thus the first and second working plan of Buxa Division worked mostly on uneven aged forests. Extraction of timber was done based on certain exploitable girth. From third working plan onwards clear felling followed by artificial regeneration was introduced. Since then uneven aged crops were converted to even age crop through plantations.

Buxa Tiger Reserve (BTR) was constituted in 1983. It includes forest area under Buxa Tiger Division and some area from Coochbehar Forest Division. 314.52 sq km area of BTR had been declared as Buxa Wildlife Sanctuary (BWLS) (Das, 2000; Chakrabarti *et al*, 2002). The core area of BWLS (117.10 sq km) was declared as National Park in 1992. Final notification regarding the constitution of National Park came in 1997 in the notification No.3403-For/11B-6/95 dt. 05.12.1997 of the Government of India (<http://projecttiger.nic.in/buxa.htm>).

First management plan of BTR (1983-84 to 1989-90) was to identify different limiting factors of the habitat and to mitigate these by ameliorative management and compulsory development. The 2<sup>nd</sup> management plan for core zone of the reserve (1990-91 to 1999-2000) took into consideration of the anthropogenic stress on the protected area. An Eco-Development Scheme was taken up and activities like distribution of seedlings for farm forestry, improvement of village roads, construction of culverts and bridges, provision of drinking water, irrigation facilities, community pond etc. were undertaken in the fringe areas and forest villages. However, the almost sudden decision to convert a territorial division into a Tiger Reserve is yet to be accepted by the residents of the localities in and around BTR (Pestonjee & Datta, 1999).

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<sup>1</sup> *Taungia*: This system is associated with the practice of cultivation in the vacant space between two rows of seedlings in new plantations. This system incurred a cost-effective maintenance of new plantations: no extra efforts were necessary to supply extra manure to the seedlings or remove weeds. Protection of seedlings from browsing and grazing were automatically taken care of.