CHAPTER - 3

STUDY AREA

3.1 A brief information about Mizoram

Mizoram is a state of northeastern region located in the eastern border of the country (southern part of north-eastern India) is characterized by hills with sparse to dense forest throughout. The state has a geographical area of 21,081 sq.km and lies between the coordinates of 21° 58' & 24° 35' N Latitude, and 92° 15' & 93° 20' E Longitude, with the tropic of cancer passing through the state at 23° 30' N latitude. The State has a strategic importance because of its proximity to the international boundary with Myanmar to the east and south (404 Km) and Bangladesh to the west (318 Km) as well as with neighboring states like Assam (123 Km), Manipur (95 Km) and Tripura (66 Km) (Anon. 2001).

The State comprises eight districts, namely- Kolasib, Mamit, Aizawl, Champhai, Serchhip, Lunglei, Lawngtlai and Saiha (Fig. 1). Geographically speaking, Lunglei covers the largest area district wise with an area of 4538 sq km while Kolasib district is the smallest with an area of 1382.51 sq km. Lawngtlai district and Saiha district differs from the rest of the other districts in their administrative setup. There are two Autonomous District Councils within the Lawngtlai district namely the Lai Autonomous District Council (LADC) and the Chakma Autonomous District Council (CADC) with their headquarters at Lawngtlai and Chawngte (Kamalanagar) respectively. The third autonomous district council resides within Saiha district, i.e., Mara Autonomous District Council (MADC) with it administrative seat located at Saiha town. These autonomous regions are administered in accordance with the provisions of the Sixth Schedule of the Constitution of India.
The total population of Mizoram according to census 2011 is 1,091,014 out of which 552,339 are male and 538,675 are female. The literacy percentage is 91.58% as per statistics collected by Economics & Statistics Dept, Govt. of Mizoram. The main occupation of the people is agriculture.

(a) Physiography

The physiography of Mizoram can be broadly divided into hills and valleys. The hilly terrains (High hills) are undulating with average altitude above 1300 m (msl), Medium hills with altitudes ranging between 500 m and 1300 m and Low hills with altitudes below 500 m above msl with the maximum reaching 2,200 m in Blue Mountains (Phawngpui). The hills run in the north-south direction parallel to each other with valleys in between them. Dissected hills and hillocks are dominantly found in most of the river valleys in the western part of the state.

(b) Geology

The geology of Mizoram is represented in general by repetitive succession of arenaceous and argillaceous sediments which were later thrown into approximately NNW - SSE trending longitudinal plugging anticlines and synclines. Geologically, two broad groups - Surma and Barail are eminent, where geological formation may be broadly classified under Bokabil, Bhuban and Barail formation.

The rocks of the Surma group are exposed in the western part of the state and exhibit ridge and valley features and trellis drainage pattern. Coupled with the dominance of trend lines, this unit could be separated from the Barail groups of rocks which are exposed in
the eastern part of the state; showing dendritic drainage pattern and denuded hills oriented in different directions.

In the north eastern corner along border with Myanmar, rocks show north-linear trend and sub – parallel mountain ranges and valley type of topography. This is due to the alteration of hard stone and soft shale beds, grouped under the Barail group.

(e) Drainage

Mizoram is drained by a number of rivers, streams and rivulets of various patterns and lengths. Most of the drainage lines originate in the central part of the state and flow either towards north or south directed by the north-south trending ridges. The valleys are narrow and have been carved out in softer formations. The rivers at various places form deep gorges, and cut across the striking ridges forming water gaps. The upper courses of the rivers are often intervened by waterfalls. As the drainage course is controlled by parallel ranges, the drainage of ephemeral and consequent types show trellis, dendretic as well as parallel drainage patterns.

The northern part is drained by large rivers like Tlawng (with its tributaries - Teirei and Tut), Tuivawl, Tuirial, Langkaih and Tuivai which eventually falls into the Tuiruang river in Cachar plains of Assam. The southern part is drained by much prominent rivers like Chhimtuipui (also known as Kolodyne) with its tributaries - Mat, Tuichang, Tiau and Tuipui whereas river Khawthlangtuipui with its tributaries Kawrpui, Tuichawng, Kau and De drains the south-western part of the state eventually flowing into Bangladesh. These and a few more rivers, forms their respective watersheds in the path they flow giving rise to 25 watersheds in total for the whole of Mizoram.
(d) Climate

Mizoram enjoys a moderate climate owing to its tropical location. It is neither very hot nor too cold throughout the year. The region falls under the direct influence of the south-west monsoon. As such, the region receives an adequate amount of rainfall. The climate is humid tropical, characterized by short winter, long summer with heavy rainfall.

The highest temperature is observed during May, June and July. Thereafter, the onset of monsoon brings down the temperature. The temperature continues to fall with the break of the monsoon rains, and it is minimized in December and January. In autumn, the temperature is usually between $18^\circ$C to $25^\circ$C, while winter temperature records normally between $11^\circ$C to $23^\circ$C and the summer temperature is usually between $21^\circ$C to $31^\circ$C.

It rains heavily from May to September. The average rainfall is 250 cm per annum. The north western portion of the state receives highest rainfall i.e., more than 350 cm per annum. The rainfall also increases southward with increase in humidity. While Aizawl located at $23^\circ 44'$N and $92^\circ 43'$E receives about 208 cm rainfall, Lunglei ($22^\circ 53'$N and $92^\circ 45'$E) records as high as 350 cm.

(e) Soil

The soils of Mizoram are dominated mainly by loose sedimentary formations. They are generally young, immature and sandy. Derived soils with red, loamy texture is also found with high level of laterite. The soil acidity is high; low in potash and phosphorus. But in an un-eroded soil, the content of Nitrogen is quite high fostered by accumulation of organic matters. The soils in the valleys are heavier as they were brought down by rain water from the high
altitudes. The soils of Mizoram can be classified into three orders of soil taxonomy, viz., Entisols, Inceptisols and Ultisols.

(f) Vegetation/Forest

On the basis of the abstract of Champion (1936) and Champion and Seth (1968), the forests of Mizoram have been broadly divided into 3 (three) categories:

(a) Tropical Wet Evergreen Forest: They are found abundantly in the western and north western parts of the state adjoining Bangladesh, Tripura and Cachar state of Assam. The forests are characterized by tall trees of entirely evergreen variety or nearly so. The soil has moderate water holding capacity. The prominent species in the upper storey are Dipterocarpus turbinatus, Dipterocarpus macrocarpus, Terminalia myriocarpa, Michelia champaca, Artocarpus chaplasa, Amoora wallichii, Magnifera indica, Terminalia chebula, Terminalia belerica, Podocarpus nerifolia, Duabanga sonneratoides, Protium serratum, Syzygium cumini, Adina cordifolia, Chukrasia tabularis, etc. The middle storey is dominated by Mesua ferrae, Dillenia indica, and bamboo species like Melocana bambusoides (syn. Melocana baccifera), Bambusa tulda, Dendrocalamus hamiltonii, Dendrocalamus longispathus, etc.

(b) Tropical Semi-Evergreen Forest: They are found in the central part of the state with moist mixed deciduous forests and occupy comparatively smaller areas along the slopes of higher hills. The dominants include deciduous species but the evergreen species dominate the vegetation. The dominant species are: Artocarpus chaplasa, Schima wallichii, Duabanga
sonneratioides, Chukrasia tabularis, Tertrameles nudiflora, Adina cordifolia, Parotium serratum, Salmalia insignis, Michelia champaca, Pheobe sp, Dysoxylum sp, Terminalia myriocarpa, Mangifera indica, Eleocarpus sp, Amoora wallachi, Sterculia sp, Bischofia javanica, Juglans regia, Emblica officinalis, Macaranga denticulata, Gmelina arborea, Gmelina oblongifolia, Albizia procera, Acrocarpus fraxinifolius, Mesua ferrea, Sapuim sp, Toona ciliata, Engelhardtia spicata. The under storey consists of different species of bamboos.

(c) Montane Sub-tropical Pine Forest: This type of forests is found on a higher elevation, mostly confined in the eastern fringe of the region. They are also found in strips of ranges in the western part around W. Bungmun and isolated in Sangau area in the south. The vegetation of this type is dominated by Rhododendron, Quercus dealbata, Prunus cerasoides, Myrica nagi, Quercus icana, Emblica officinalis, Rhus javanica, Butea minor Pinus kesiya, Quercus xylocarpa etc. Other common species of this classification are Eurya symplocina, Clerodendron, Rubus ellipticus, Derris wallichii and Rubus sirmanicus etc.
3.2. Tawi Wildlife Sanctuary

Tawi Wildlife Sanctuary is selected for the present study. The sanctuary is located in the South eastern part of the Aizawl District, Mizoram (Latitude - 23°30’N and Longitude 93°E), with altitude ranging between 500 m- 1894 m asl. It occupies an area of 35.75 sq. km, and is situated about 101 km, from the state capital Aizawl towards east. The sanctuary was notified as a reserve forest in 1978 vide Government of Mizoram Notification No. FOR. 15-C/74-78/21 dt.29.11.78 and a preliminary notification to declare an area of 35.75 sq.km of this reserve forest as “Tawi Wildlife Sanctuary” has been issued vide Govt. Notification No.B.120/12/15/94-FST dt.8/4/1999. The location map is shown in Fig: 3.1

Boundary description of Tawi Wildlife Sanctuary:-

**North:** Crossing above the Khuaimual (Hill ridge) upto the water supply. It then follows Vawmhrawhlui upstream upto Tawizo saddle (Liamkawn).

**East:** From the saddle (Liamkawn) it goes towards south following Maite approach Road upto the source of Vaiden lui along the foot path. And then, it goes to a small lake above Hruiuai crossing the lake upto Bak puk. It then goes to Riahbuk mual and meets Maite Jeep road. It then goes along the foothills catching Hmuntha road upto the place called Lungmaite.

**South:** From Lunghnute it follows the foothills of Tawi hill towards north-west direction and then crossed Saza stream and then meets Bengchatlui (stream).

**West:** From Bengchatlui (stream) source it follows the foothills towards north. It then meets river source of R.Tuikum and then crossing Kawlhawk kah kawn (saddle) and meets Khuailui (stream) the starting point of northern boundary.
3.2.1. Approach road

Fair weather 407 Mini Truck road from Chhingchhip via Hmuntha which is about 20 kms away from Chhingchhip and from Hmuntha village the road links to other villages like Maite, Tawizo, Hualtu by a fair weather jeepable road. From Chhingchhip there is also a fair weather jeepable road which directly links to Hualtu village. There is also another road from Mualpheng via Maite which is a fair weather jeepable road and is approximately 25 kms. This road links to villages like Hualtu, Hmuntha, Keifang, Tawizo by a fair weather jeepable road, it also links to Chhawrtui, Rullam and Puilo villages by footpath.

3.2.2. Climate

The climate of Mizoram as a whole is controlled by its location, physiographic, pressure regime in the North West India and Bay of Bengal, warm and moist maritime tropical air masses from the Bay of Bengal, Local Mountain and valley winds. In addition, the Chin Hills, Arakan Yoma Hill Tracts and Chittagong Hill Tracts also play an important role in shaping the climatic condition of the state.

The climate of Mizoram is Tropical Monsoon type of climate. So, Tawi Wildlife Sanctuary which is located in Aizawl district, falls under the north-central part of the state enjoys a moderate climate owing to its tropical location. Aizawl district falls under the direct influence of the south west monsoon. As such the area receives an adequate amount of rainfall which is responsible for a humid tropical climate characterized by short winter and long summer with heavy rainfall.
3.2.3. Season

Based on the variation in temperature, rainfall, humidity and other general weather conditions, four different types of season are observed for the district. They are as follows:

(i) The cold or winter season

Winter season starts from the month of December to first half of February. This is the coldest season of the year. During this period rainfall is much less as compared to other seasons, and whatever amount rainfall received is originated from North East Monsoon, generally known as the 'Retreating monsoon'. This season is very pleasant with clear blue sky in the absence of cloud covering and all the people of Mizoram are in festive mood since the most celebrated festival 'Christmas' occurs during this season.

(ii) Spring season

Spring season is the shortest season of the year. It starts from the second half of the February to the first half of March. Temperature is mild during this period and the sky is clear and the Mizo people accustomed to build new houses during this season as there are no weather disturbances during the period.

(iii) Summer season/Rainy season

Summer season or rainy season is the longest season covering about seven months starting from the second half of March till the first half of October. The early part of this season i.e., from second half of March till first half of May is characterized by bright sunshine
and clear sky with little or no cloud till it is disrupted by the coming of Monsoon showers. The months of July, August and September are the warmest months for the whole year but the excruciating temperature condition is quashed by the occurrence of the usual monsoon rains and yet maximum insolation is received during the early part of this season, *i.e.*, April and May.

A study from the daily rainfall records also reveals that the heavy outpour generally starts from the second quarter of May and this heavy outpour is usually subsides in the first quarter of October. Rainfall during May, June, July, August & September *i.e.*, 5 months alone contributed 76% of the total annual rainfall. This is the season in which the cyclonic rains are often felt. The temperature remains high, but is kept down to a considerable extent by the usual rains.

(iv) **Autumn season**

Autumn season covers for a period generally starting from the second part of October to November. The season is very pleasant and the summer rain already diminished. This is the season the Mizos are longing for since they have no undone jobs in their paddy fields, just waiting for the ripening of their paddies. People are in festive moods. During this time one of Mizo festivals called 'Mim Kut' was used to be celebrated. But now what we called 'Thalfavang Kut' takes the name instead and is celebrated with joy.

3.2.4. **Topography**

The Tawi hill range and its surrounding are characterized by many spectacular scraps. These scraps are generally very steep, and made up of hard rock units. The spurs are mainly running in east – west directions. The spurs on the eastern side of the main ridge are relatively long and gentler than the spurs on the western side.
Structural Hills as the name implies, is of structural origin, associated with folding, faulting and other tectonic processes. High structural Hill (above 1200m) is found at the peak of Tawi and Medium structural Hill (500-1200m) is also found below this peak.

3.2.5. Geology and soil

The study area occupies the north-central part of the state and represents a monotonous sequence of argillaceous rocks, which are classified by Geological Survey of India into two formations viz., Middle Bhuban and Upper Bhuban formations. The formations are folded into almost N-S trending anticlines and synclines and affected by longitudinal, oblique and transverse faults of varying magnitudes.

The soil is acidic in nature due to heavy rainfall. It contains a high amount of organic carbon and is high in available nitrogen, low in phosphorus and potassium content. On the basis of rainfall and humidity, the soil moisture is classified as Udic. Classification of soils of the area has been done according to soil taxonomy on the basis of their physico-chemical and morphological properties. The soils found at order level are Entisols, Inceptisols and Ultisols. Under further placement of the soils into lower categories the soils are very deep, dark brown to yellowish red, clay loam to clay, very strongly acid, well drained, hill side slopes, severe to moderate erosion, patchy thin cutans are formed. Loamy skeletal, mixed, hyperthermic.
Fig. 3.1. Map of Mizoram
### 3.2.6. Drainage

The drainage of the study area follows dendritic pattern. Most of the streams within Tawi Wildlife Sanctuary flows towards the western side, while few streams namely - Vaidan lui, Khuai lui and their tributaries flows towards east. The eastern and western streams are separated, within the study area, by a ridge which runs almost along N – S direction.

To the northern periphery of the study area, flows Vawmrawh lui along western direction, draining several small streamlets. Vawmrawh lui is joined by Khuai lui. Other important streams within Tawi Wildlife Sanctuary are Bengchat lui and Saza lui. These two streams drain several streamlets on their way to western side (Fig. 3.2).

Streams flowing towards western side are comparatively long, and appear to flow through a rather rugged terrain as compared to streams flowing towards inside of the study area.
Fig. 3.2 Drainage Map of Tawi Wildlife Sanctuary
3.2.7. Vegetation

The vegetation of the sanctuary falls under the Tropical semi-evergreen and Subtropical broadleaved hill forests. The area experiences equable warm climate to chilly winter during November-January at the higher altitude.

The year is broadly divided into – summer - late March to May; rainy season- June to October and winter season- November to early March. Maximum temperature ranges between 17°C to 28°C and the minimum between 10°C to 16°C with the annual rainfall between 2000 and 2500 mm. June and July experience heavy showers.

Tawi Wildlife Sanctuary is rich in diversity so growth of vegetation is luxuriant (Fig. 3.3). A great variety of tree species, palms, canes, bamboos, shrubs, herbs, climbers and epiphytes are found growing inside the forest (Plate 1a).

The forest is mainly composed of trees like *Persea petiolaris*, *Syzgium cuminii*, *Cinnamomum bejolghota*, *Quercus lineata*, *Bruinsmia polysperma*, *Ostodes paniculata*, *Fagerlindia fasiculata*, *Macropanax dispermus*, *Dysoxylum gobara*, *Glochidion khasicum* etc. The shrubby undergrowth is chiefly composed of *Strobilanthes parryorum*, *Blumes lanceolara*, *Clerodendron viscosum*, *Polygonum chinense*, *Scleria levis*, etc. Lianas and climbers are represented by *Cayratia obovata*, *Clementis sikkimensis*, *Smilex perfoliata*, *Mellettia pachycarpa* etc.

A large number of species found in the sanctuary have high economic potential and many of these are used by the locals in their daily life. Some of the important species which have medicinal value are *Embelia ribes*, *Hedyotis scandens*, *Bergenia ciliata*, *Aechynanthus sikkimensis*, *Costus speciosus* etc. It also harbours many edible plants like *Dysoxylum gobara*, *Amomum dealbatum* and a great variety of edible *Agaricus spp*. It is also rich in canes and palms species which are of great economic value.
Grassland is a unique type of vegetation found in Tawi Wildlife Sanctuary. Major portion of this grassland area is covered by tall grasses. The common species are *Imperata cylindrica, Cympogon winterianus, Saccharum longisitosum* (Plate 1b).

One important thing to be noted while mentioning about the vegetation of Tawi Wildlife Sanctuary is the abundance of a unique bamboo species with thorns at the nodes *Arudinaria callosa* which is endemic to Mizoram.

Within the area of Tawi Wildlife Sanctuary there is a big cave which is not far from Hmuntha village. This cave has attracted many visitors. The main visitors are students from different parts of Mizoram and adventure clubs.

The research work has been started from November 2006 after having permission to take up research work in the sanctuary from the Chief Wildlife Warden, Dept. of Environment & Forest; Government of Mizoram (No. A. 33011/2/99-CWLW/128).
Fig. 3.3. Vegetation Map of Tawi Wildlife Sanctuary
Plate 1

Plate 1a: Forest

Plate 1b: Grassland