

# CHIKMAGALUR DISTRICT

## CHAPTER I

### GENERAL

THE Chikmagalur district (which was called Kadur district till 1947) is one of the nineteen districts of Karnataka. It is situated roughly in the south-western part of the State. A large area of this district is *malnad*, i.e., a largely forested hilly region of heavy rainfall. The stupendous barrier of the Baba-Budan mountain range is in the centre of the district. The western ghats range, which borders the western part of the district, rises into some of the loftiest peaks. The landscape of the tract is highly enchanting. The slopes of the mountains and hills here are replete with fascinating natural beauty. They are clad with thick forests, through which the shining streams wind their way, fertilising the narrow valleys and glades.

#### Origin of name

Like most of the districts in the State, this district also has derived its name from its headquarters town, Chikmagalur. *Chikka+Magala+Ooru* literally means "younger daughter's town". It is said to have been so named, having been given as dowry to the younger daughter of Rukmangada, a legendary chief of Sakharayapatna. The name of another locality of the town called Hiremagalur, (*Hire+Magala+Ooru*), signifies "elder daughter's town". This place, according to the same tradition was similarly bestowed upon his elder daughter. But several old inscriptions reveal that these two places were previously known as *Kiriya-Muguli* and *Piriya-Muguli* respectively. Whereas *Kiriya* and *Piriya* mean younger and elder, *muguli* is the name of a plant. Perhaps these names were later altered.

#### Location

The district is situated between 12° 54' 42" and 13° 53' 53" north latitude and between 75° 04' 46" and 76° 21' 50" east longitude. Its greatest length from east to west is about 138.4 km and from north to south 88.5 km.

### **General boundaries**

It is bounded on the east by the Tumkur district, on the south by the Hassan district, on the west by the western ghats which separate it from the Dakshina Kannada (South Kanara) district, on the north-east by the Chitradurga district and on the north by the Shimoga district.

### **Area and population**

The geographical area of the district as per the 1971 census is 7,199 square km. The population, which was 5,97,305 (3,13,795 males and 2,83,510 females) in 1961, had increased to 7,36,647 (3,80,297 males and 3,56,350 females) by 1971. In respect of area, the district occupies the 15th place, while in regard to population, it gets the 18th place in the State. It accounts for 3.76 per cent of the total area of the State and 2.51 per cent of the total population of the State (as in 1971). In point of density of population, the district ranked 16th among the districts of the State in 1971. It was recorded that there were 102 persons per square km in this district. This was much below the State average which was 153 per square km in 1971.

### **History of the district as an administrative unit**

From an early period, the area was a part of the dominion of the Kadambas of Banavasi. Later, the Gangas of Talakad held sway over some parts of the district. In the 7th century A.D., Santara Deva founded a principality at Humcha in Shimoga district and then his dynasty extended its control southwards as far as Kalasa in this district, which became their new capital. The Santaras ruled over the area for a long time. It was in this district that the illustrious Hoysalas had their origin in the early part of the 11th century, at Sosevur, known also as Sasakapura (now called Angadi), in the Mudigere taluk. Later, with their capital at Dorasamudra (Halebid in the Hassan district), they gradually rose to great power, built-up a formidable kingdom and played a memorable role in South India upto about the fourth decade of the 14th century.

Under the Vijayanagara empire, the western part of the district was under the Santaras who had their capital at Karkal in Dakshina Kannada, the southern part under the Nayakas of Aigur and the north-eastern parts under the Basavapatna (later known as Tarikere) chiefs. Later, a greater part of the district became a possession of the Keladi kingdom. In the 17th century, Shivappa Nayaka, the Keladi ruler, gave shelter to Sriranga Raya, the fugitive emperor of Vijayanagara with Sakharayapatna (Sakrepatna), Belur and the neighbourhood, as the latter's estate. However, after a few years, Sriranga Raya left the region. As a result of a treaty between the kingdoms of Keladi and Mysore, some parts came into the possession of the Wodeyars of Mysore in 1694 A.D. In 1763 A.D., on Haidar Ali's seizure of Bednur, the area of the district became completely a part of Mysore.

After the downfall of Tipu Sultan in 1799 A.D., when royal power was restored to the Wodeyars of Mysore, this district formed a part of the Nagar Division.

### **Territorial changes**

There were frequent local changes in regard to the taluk limits of the district. It appears that originally the district had only Kadur, Yagati, Garudanagiri and Banavar taluks. Later, Garudanagiri taluk was merged with Banavar taluk, and the Yagati taluk was absorbed in Kadur taluk. Till 1875, the western portion of Chikmagalur taluk formed a part of a separate taluk of Vastare, formed earlier in about 1863. The taluk of Mudigere was brought into existence in 1876, bringing together some of the villages of Manjarabad, Belur and Vastare taluks. Lakkavalli gave its name to a taluk which included Baba-Budan mountains and parts of Koppa and Balehonnur taluks till 1882. In that year, Kadur and Banavar were combined into one taluk of Banavar. The district was restricted to its present limits in 1886 when the Hassan district was restored. The Kalasa *magani* (a group of villages) was transferred to Balehonnur taluk in 1897. The headquarters of Koppa taluk was at Hariharapura till 1897. The Yedehalli sub-taluk (now Narasimharajapura taluk) was attached to Koppa taluk till 1897.

In 1947, the name was changed from Kadur district to Chikmagalur district. Prior to this change, in 1865 itself, the district headquarters was changed from Kadur to Chikmagalur town. Till 1958-59, there was a separate Jagir of Sringeri (see ch. XI). During that year, it was made an independent taluk with the single Sringeri holbi. Later in 1965-66, Kigga hobli was transferred from Koppa taluk to Sringeri taluk. The taluks of Koppa and Sringeri, which were in Tarikere subdivision, were transferred to Chikmagalur subdivision in 1973.

### **Subdivisions and taluks**

For administrative purposes, the district is divided into two subdivisions, viz., Chikmagalur subdivision and Tarikere subdivision. The former consists of Chikmagalur, Mudigere, Sringeri and Koppa taluks, while the latter comprises Tarikere, Narasimharajapura and Kadur taluks. The area of each taluk and number of its inhabited villages \* and population of each

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\* The Karnataka Land Revenue Act, 1964, has defined a village as follows.

“ Village means a local area which is recognised in the land records as a village for purposes of revenue administration and includes a town or city and all the land comprised within the limits of a village, town or city ”.

For the Census purpose, a village has been defined as the area included within the jurisdiction of a revenue village and as such, is inclusive of also scattered hamlets and isolated home-steads coming within the boundaries of a revenue village .

A hamlet may be said to be a subsidiary village which is not considered to be an independent village, but is a part of the main village.

taluk are indicated in the table given below.

Sl. No.	Taluk	Area in Sq km	No. of inhabited villages	Population (1971)
1	Chikmagalur	1,609.2	216	1,75,265
2	Kadur	1,414.6	241	1,87,280
3	Koppa	572.4	80	67,566
4	Mudigere	1,163.6	139	86,567
5	Narasimharajapura	804.8	58	43,077
6	Sringeri	433.7	47	27,632
7	Tarikere	1,224.8	203	1,49,260
Total		7,223.1*	984**	7,36,647

The seven taluks of the district have been further subdivided into 32 hoblis (revenue circles), each of which, in turn, consists of a number of villages. The statement given hereunder shows the number and names of hoblis grouped under each taluk in the district for purposes of revenue administration.

Sl. No.	Taluk	No. of hoblis	Name of hobli
1	Chikmagalur	8	Chikmagalur, Vastare, Aldur, Avati, Khandya Jagara, Ambale, Lakhya.
2	Kadur	6	Kadur, Birur, Hirehallur, Yagati, Singatagere Sakrepatna.
3	Koppa	3	Koppa, Jayapura, Hariharapura.
4	Mudigere	5	Mudigere, Gonibeedu, Banakal, Balur, Kalasa
5	Narasimharajapura	2	Narasimharajapura, Balehonnur.
6	Sringeri	2	Sringeri, Kigga.
7	Tarikere	6	Tarikere, Lakkavalli, Lingadahalli, Amrutapura, Ajjampura, Shivane.
Total		32	

A village without any residents is referred to as 'uninhabited' or 'bechirakk'. The latter word literally means without any light.

\*The taluk-wise figures are for the reporting area for land-utilisation purposes, as worked out by the State Survey Department and local bodies. The geographical area of the district as computed by the Survey of India is 7,199.0 sq km. The slight difference is due to different methods employed in measuring the areas.

\*\*In addition, there were 125 uninhabited villages in the district as per the 1971 Census

## TOPOGRAPHY

**Natural divisions**

Large parts of the Chikmagalur district are mountainous. There is a formidable ghat range in the west of this area which has some of the loftiest peaks between the Himalayas and the Nilgiris. The stupendous barrier of the Baba-Budan chain of superior elevation is in the centre. There is a network of high hills in between these two towering masses. There are also more modest ranges which extend throughout the north and the east with a little exception eastwards. The magnificent Merti peak of Kalasa is a conspicuous land mark. Thus, this district (with a small exception in the east) may truly be described as pre-eminently a high-land area. The eastern parts of Kadur and Tarikere taluks partake the features of *maidan*, an open tract (level-land). The transition from *malnad* to *maidan* is very abrupt and striking on approaching Lakkavalli from the west.

**Mountains**

The congeries of mountains seem to range themselves into a central ridge running north and south, with a great loop or circle on either side. The main ridge commences at Ballalarayanadurga, and passing east of Merti-gudda and Koppadurga, separates the basin of the Bhadra from that of the Tunga, and runs up towards Mandagadde, connecting with the central range of the Shimoga district. On the west of this ridge is the valley in which lies Sringeri, enclosed with a girdle of mountains. To the east of it, beyond the right bank of the Bhadra, is the Jagara valley, which is completely surrounded by the Baba-Budan mountains.

**Chandradrona or Baba-Budan range**

The Chandradrona or Baba-Budan range, the loftiest range on the Karnataka table-land, is situated in the centre of the Chikmagalur district between  $13^{\circ} 25' 46''$  latitude and  $75^{\circ} 45' 27''$  longitude. This range is called Chandradrona in the *Puranas*. In recent times, it is known as the Baba-Budan range. The form of the chain is that of a horse-shoe, with the opening to the north-west. The northern arm, commencing with the Hebbegudda\* 1,337.4 metres (4,385 feet), stretches eastwards without interruption for about 25 km. Bending southwards, it presents to the east an unbroken wall of more than 32 km. The southern arm is formed by the Basavanagudda and Woddinagudda ranges. The character of the chain is that of a tremendous ridge, 1,829 metres above the sea-level, and in some parts only a few yards wide at the summit, rising at intervals into loftier peaks. The summit of the hills consists of steep grassy slopes, well wooded in the ravines. The sides are densely clothed with forests, among which are numerous coffee plantations.

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\*Gudda — a hill in Kannada

### Loftiest peaks

The highest point in the district and in Karnataka is Mullaiyanagiri \* which rises to 1,926.7 metres (6,317 feet) above the sea-level and is situated towards the south of the range. It is one of the loftiest mountains between the Himalayas and the Nilgiris. Another lofty peak is the Kudremukh (correctly *Kudure Mukha*) signifying 'horse-face' mountain. It is called so because of its such appearance from the sea. It is a well-known landmark for navigators on that coast. It is 1,895.6 metres (6,215 feet) high. Next to this is Baba-Budangiri 1,895.3 metres (6,214 feet). Near it are the sources of the Veda and the Avati rivers. The conspicuous conical peak on the outer verge of the eastern face is Devirammanagudda. Near the north-east angle is situated Kallahattigiri which is 1,877.3 metres (6,155 feet) in height. On the north-east of the mountains is the Hebbe Falls (descent of 183 metres or 600 feet) of a stream which runs into the Bhadra river. On the Baba-Budan mountain, there is a noted shrine known as Sri Guru Dattatreya Peetha also called and recognised as Guru Dattatreya Baba-Budan Swami's Dargha which is highly venerated by both Hindus and Muslims. Ballalarayanadurga is a fortified hill in the western ghats. It is 1,506.7 metres (4,940 feet) high and is situated in 13° 8' north-west angle of the Mudigere taluk. The fortifications here were erected by the Hoysalas. It was an important stronghold of the rulers in the past.

### Other summits

The Gangamoola \*\* in Varaha-Parvata † is 1,458.2 metres (4,781 feet), Woddinagudda 1,526.8 metres (5,006 feet) and Lakke-Parvata 1,421.9 metres (4,662 feet). Of greater height is the superb hill near Kalasa called the Mertigudda, situated in the heart of the mountain region to the west, and presenting, especially towards the north, a grand and symmetrical outline, towering above all the neighbouring heights, its summit being 1,662.6 metres (5,451 feet). Other prominent peaks in the district are Kanchinakaldurga 1,244.7 metres (4,081 feet), Shakunagiri 1,419.2 metres (4,653 feet) and Koppadurga 902.8 metres (2,960 feet).

## WATER RESOURCES

### Rivers

A larger portion of the district, i.e., 86 per cent, falls under the Krishna basin, while the Cauvery basin covers 8.4 per cent and the west-flowing rivers include 5.6 per cent. The principal rivers of the district are the twin streams—the Tunga and the Bhadra, the latter running most of its course in this area. Other rivers, which originate in the district are the

\*Giri — a mountain in Sanskrit and Kannada.

\*\*Moola — Source in Sankrit and Kannada.

†Parvata — Mountain in Sanskrit and Kannada.

Hemavati, the Yagachi, the Veda, the Avati, the Netravati, etc. The Tunga, the Bhadra and the Vedavati come under the Krishna basin, while the Hemavati and the Yagachi under the Cauvery basin and the Netravati among west-flowing rivers. There are also several minor streams in the district, but they are not of much importance. There are also two big tanks namely, the Ayyanakere and the Madagakere.

### **The Tunga**

The river Tunga rises at Gangamoola on the Varaha-Parvata, high up in the western ghats, at an elevation of about 1,198.0 metres in Sringeri taluk. The source of this river is very close to that of the river Bhadra. It first flows north-east, passes Sringeri, the famous seat of Shankaracharya monastery, and then to Baggunji where it turns north-west, and crossing Hariharapura, enters the Shimoga district. The length of the river in this district is about 50 to 55 km. The river bed here is of rocky outcrop. The water of this river has a fine taste which has given rise to the saying "Bathe in the Ganga, but drink of the Tunga" (*Ganga snaana, Tunga paana*).

### **The Bhadra**

The river Bhadra also rises at Gangamoola on the Varaha-Parvata, on the western boundary of the Chikmagalur district at an elevation of about 1,198.0 metres. It first flows eastwards for some distance past Kalasa. Then it flows in north-east with a winding course past Balehonnur and then to Hebbe where it receives the Somavahini from the Jagara valley. It continues to Lakkavalli and then flows on to Bhadravati in the Shimoga district. The length of the Bhadra in this district is about 32 km. A dam has been constructed for this river near Lakkavalli for irrigation and also to produce electricity. It unites with its sister stream, the Tunga, at Kudli in the Shimoga district, whereafter the combined river is called the Tungabhadra.

### **The Netravati**

The river Netravati also rises at Gangamoola on the Varaha-Parvata where the rivers Tunga and Bhadra rise. After flowing towards west for a short distance, down the Bangadi valley past Belthangady in the Dakshina Kannada district, after which it joins at Uppinangady by another stream called the Kumaradhara.

### **The Hemavati**

The Hemavati-nadi, meaning 'golden river', is also called Yenne-hole (the oily or shining river). It has its source near Javali in the Mudigere taluk, and is one of the chief tributaries of the Cauvery. After running in a south-eastern direction for about 35 km, it leaves this district near Hiresagara in the Mudigere taluk and enters the Hassan district.

### Mythological association

A puranic legend relates that demon Hiranyaksha, son of Kashyapa by Diti Devi, seized large parts of the earth and submerged it in water. Those aggrieved by this implored god Vishnu to rescue their land. Being moved by their plight, he assumed the form of Varaha (boar), plunged into the ocean, entered the lower world, destroyed the demon, and brought up the earth again. The perspiration arising from this exertion of the boar trickled down its tusks as it rested on the Varaha-Parvata and from the high (*tunga*) left tusk became the Tunga river and the stream coming down from its right tusk which was pleasant and beautiful (*bhadra*) became known as the Bhadra river; the Netravati sprang from the drops which fell from the eyes (*netra*) of the boar, so says the myth.

The Hemavati river is fabled to be Dakshayini (Parvati), the daughter of Daksha, and consort of god Shiva. Daksha once performed a sacrifice to which he did not invite her husband. Feeling slighted by this, Dakshayini cast herself into fire. But when she emerged from the fire unscathed, she was of the colour of *hema* (gold). She performed penance for getting reunited with Shiva who appeared before her and asked her to take the form of a river for the good of the world, and so she did, according to a legend.

### The Vedavati

The Vedavati is also called the Hagari. It is formed by the confluence of two streams, the Veda and the Avati, which spring from the eastern side of the Baba-Budan range. The immediate source of the Veda is the Gauri-halla which rises near Mullaiyanagiri peak. After emerging from the valleys, the stream flows eastwards and is embanked at a gorge near Shakunagiri, called the Ayyanakere, not far from Sakrepatna on the Kadur-Chikmagalur road. The stream, on leaving this tank, is called the Veda and it flows north-east to Kadur. The northern stream, the Avati, which also rises near the peak of Mullaiyanagiri flows eastwards and is embanked at a gorge, formed by two hills, Shivanagiri and Hagarikanagiri, and forms the large Madagakere. The two streams join near Kadur whereupon they are together called the Vedavati as the single river. The bed of this river is of sandy soil. It flows for about 55 km in the district and then runs into the Chitradurga district.

### The Yagachi

The river Yagachi, also called Badari, rises in Seethalayyanagiri of the Baba-Budan range in Chikmagalur taluk. The length of its flow in this district is about 20 km. After running through Hiremagalur, it leaves the district near Ambale village of Chikmagalur taluk and flows into the Hassan district. It is the chief tributary of the Hemavati and joins it near Gorur in the Hassan district.



**Ayyanakere**

The Ayyanakere, a large tank, is a fine expanse of water, situated at the eastern base of the Baba-Budan range about six km north-west of Sakrepatna. It is formed by the embankment of the Gauri-halla stream at the foot of Shakunagiri. Its out-flowing waters are called the river Veda. The tank provides irrigation facilities to about 1,560 hectares in Kadur taluk (see ch. IV). The construction of this tank is attributed to Rukmangada Raya, a ruling Chief of Sakrepatna. According to a myth, the 'guardian-goddess' of the lake once forewarned Honbilla, the *nirganti* (waterman) about an impending danger from breach of its bank. He obtained a promise from her to stall the catastrophe until he returned with orders from his master about what to do. He hastened to the town and appraised the Chief of the impending danger. The wily Chief, thinking that under the condition of the promise by the goddess, prevention of return of the messenger would avert the calamity for ever, had him put to death on the spot. And so, the legend says, the embankment remained intact.

**Madagakere**

Another tank called the Madagakere is constituted by an embankment of the Avati stream at a point where the two hills called Shivanagiri and Hagarikanagiri so nearly meet as to form a natural basin. This tank provides irrigation facilities to about 2,039 hectares in the Kadur taluk.

**Ground water**

A separate Ground Water Cell was created in the Karnataka State Department of Mines and Geology in 1966, with a view to carrying out systematic studies and to collect basic data. The average annual rainfall in the district is 1,989.8 mm. (78.34"). The taluks of Tarikere and Kadur and parts of Chikmagalur taluk, which receive lesser rainfall, depend, to a considerable extent, upon ground water for irrigation and other purposes. The irrigation by tanks is seasonal. All the seven taluks of the district have been surveyed by the department. According to this source, there is good ground water potential in the area. The main source for ground water is atmospheric precipitation. It is discharged artificially by abstraction of water from wells. The ground water recharge and discharge in the district are as stated below.

Sl. No.	Taluk	Recharge Mm3	Discharge Mm3	Balance potential available Mm3
1	Chikmagalur	118	1.00	117.00
2	Kadur	68	4.00	64.00
3	Koppa	34	0.02	33.98
4	Mudigere	114	0.38	113.62
5	Narasimharajapura	44	0.05	43.95
6	Sringeri	48	0.08	47.92
7	Tarikere	32	10.00	22.00
	Total	458	15.53	442.47

As disclosed by this statement, only a very small part of the available ground water has been utilised. There were 1,839 wells. Of these 1,143 wells were fitted with pumpsets and 696 with other devices as in 1979. The taluk-wise details thereof were as under.

Sl. No.	Taluk	No. of wells with pumpsets	No. of wells with other modes of lift	Total No. of wells
1	Chikmagalur	100	34	134
2	Kadur	330	113	443
3	Koppa	2	0	2
4	Mudigere	31	0	31
5	Narasimharajapura	41	0	41
6	Sringeri	7	0	7
7	Tarikere	632	549	1,181
Total		1,143	696	1,839

## MINERAL RESOURCES

### Geology

This district is made up entirely of Archaean schists and gneisses. The Dharwar schists occupy 50 per cent of the area of the district and occur in three well-defined belts, namely, (a) the Kudremukh-Gangamoola belt, (b) the Koppa and (c) the Baba-Budan belt.

### Kudremukh belt

The Kudremukh belt runs from Kudremukh to Gangamoola and northwards for a length of 96 km with an average width of 3.2 km to 4.8 km except near Sringeri where it is much wider and covers altogether an area of about 388.5 sq km. The belt comprises hornblende schists, amphibolites, chlorite schists, mica schists and thick beds of magnetite quartzites. The hornblende schist and amphibolite form the oldest units. The major parts of hornblende schists are dark and fine-grained and very often grade into dark chlorite and biotite schists. The amphibolites are entirely composed of matted aggregates of actinolite and tremolite, and are often intimately mixed up with fine-grained dark hornblende schist. The chlorite schists are exposed prominently near Malleshwara, Shitebhume and Gangrikal ridges. The mica schists are usually found developed at the contact zones of the belt, with granite gneisses. The magnetite quartzite forms a striking unit in the belt and is intricately folded.

### Koppa belt

The Koppa belt extends from near Kalasa in a north-north-east direction for a distance of 48 to 64 km. It has a width of 4.8 km and covers about 155 to 181 sq km before passing on to the Shimoga district. The rock-types met within this belt are hornblende schist, chlorite schist, gritty argillites and magnetic quartzites.

### **Baba-Budan belt**

The Baba-Budan belt which is located east of Koppa belt, includes crescent-shaped hill range and the lower ground to its east. The Baba-Budan belt is made up of hornblende schists and traps, amphibolite quartzites, mica chlorite schists and capped by ferruginous quartzites. A younger group consisting of felsites, porphyries, chlorite schists, thick beds of conglomerate (Kaldurga conglomerate) and argillite and other rocks of sedimentary origin are found near Tarikere.

### **Granitic gneisses**

The rest of the area is made up mainly of granitic gneisses and granites collectively grouped under the name peninsular gneissic complex. Granites are found near Chikmagalur town. The gneisses around Balehonnur are considered to be the oldest rocks in the State formed more than 3,000 million years ago.

## **MINERALS**

Several economic minerals, viz., asbestos, bauxite, chromite, clay, copper, corundum, garnet, graphite, iron ore, kaolin, kyanite, limestone, manganese, mica, etc., are found in this district. Of them, iron ore is found extensively and being exploited on a large scale.

### **Iron ore**

Extensive deposits of iron ores of varying grades are found in this district. The occurrence of iron ores in the Baba-Budan range had been known from a very long time. The ridges show massive beds of magnetite and haematite quartz rocks, dipping towards the centre of the range. The ferruginous quartzite beds are capped by a crust of iron ore which may range from 15 to 30 metres in thickness.

The beds in the lower portion of the series appear to be largely composed of magnetite and quartz. In the middle portion is found haematite and quartz with some magnetite, while the upper layers are made up of hard haematitic ore mixed up with ochres and limonitic material. Rich ore concentrations are found at Kemmannugundi, Kallahattigiri and Jenusurigudda. Except for ten metres where ore is hard, the rest of the material is friable and soft.

The iron ores of Kemmannugundi are mined by the Visvesvaraya Iron and Steel Works Ltd., Bhadravati. The iron content of the ore varies from 55 to 65 per cent, with less than 3 per cent of silica and about 6 per cent of alumina. In recent years, their production has ranged from 1 to 1.5 lakh tons. The southern Baba-Budans extending from near Baba-Budangiri upto the Somavahini river are formed of massive beds of magnetite quartzite. In the neighbourhood of Kallahatti in the eastern

branch of Baba-Budans, iron ore beds are seen over an area of nearly ten sq km. The ore contains between 58 and 62 per cent of iron and is mostly haematite and limonite. The iron ore is found as cappings over ferruginous shale at Jenusurigudda, a hill within the crescent shaped Baba-Budan range. The reserves are estimated at seven million tons analysing 58.9 per cent iron with a lump recovery percentage of 35.

#### **Kudremukh and Gangamoola**

Extensive beds of magnetite quartzite ranging in thickness from 120 to 200 metres and extending continuously over a length of 50 km are seen forming the lofty ranges of Kundremukh—Gangamoola and Gangrikal on the western borders of the Chikmagalur district. The magnetite quartzites which are seen overlying amphibolites are black in colour and friable to a depth of 30 metres. Beyond this depth they are dark, compact and massive. The reserves of readily workable ore are estimated at over 3,000 million tonnes and the average iron content of the ore is 30 per cent.

The Kudremukh iron ore deposit is located in the Kudremukh-Aroli-Gangamoola range of western ghats and is about 64 km from the developing port of Mangalore. It is also approachable by road through Kalasa, a small town 25 km to the east-south-east of the deposit. The ore body is described by geologists as a sedimentary pre-cambrian formation, composed of thin laminated layers of magnetite and quartz. The deposit was first discovered in 1913 by late P. Sampat Iyengar of the Mysore Geological Department. Detailed exploration was carried out by the National Mineral Development Corporation in 1965. The ore body extends over a length of 6 km longitudinally, and laterally, over a distance of 800 metres. The deposit is estimated to contain about 610 million tonnes of weathered ore and about 520 million tonnes of underlying primary massive low grade magnetic ore. Iran evinced a keen interest in the development of the Kudremukh mines and extended credit facilities for its development. Kudremukh Iron Ore company Ltd., a Government of India enterprise and administered by the Union Ministry of Steel and Mines, was established in April 1976. This organisation has been entrusted with the task of mining beneficiation and transporting the ore as slurry to Mangalore and shipping it abroad (see ch. V).

#### **Corundum**

Ruby-red corundum associated with blue kyanite, in the form of isolated sporadic crystals in decomposed granitic gneisses has been located at Kadumane about five km north-north-east of Sringeri. The crystals are of fairly good colour, but show numerous cracks on cutting and polishing. Corundum is also found at Melukoppa, about 15 km north of Kadumane.

#### **Kaolin**

Deposits of Kaolin (China clay) of varying degrees of purity occur beneath cappings of laterite at Mattagod, Asagodu, Hoskoppa, Kakkod

and Hariharapura in Koppa taluk, Kikkare, Honnavalli, Nidadale Somlapur, Puradtola and Malhalli in Sringeri taluk, and Garbail in Narasimharajapura taluk. Some of the deposits are fairly extensive and yield good material on washing.

### **Kyanite**

Kyanite, ranging upto an inch in length or slightly more, is found occurring in association with red corundum in decomposed granitic gneisses at Kadumanē. It is also found at Kelakoppa, Addegonda, Kirkod, Kikkare, Heruru, Hulgur and Bachinakoppa of Sringeri taluk, and Dayamballi, Marikudi and Kakkod in Koppa taluk.

### **Mica**

There is a mica-bearing zone extending from Sringeri to about 25 km northwards. In this tract, deposits near Kikkare were mined to some extent in previous years. Green-chrome mica (fuchsite) bearing quartzite occurs at Belavadi. It forms a pretty ornamental stone. Fuchsite-quartzite is found at Yarehalli.

### **Asbestos**

Amosite asbestos is found to occur in Manikyadhara mine area (Arasinaguppe), Dhoopada-giri tract and Dattatreya Peetha. It is being mined by M/s. Hyderabad Asbestos Cement Products Ltd.

### **Garnet**

Garnetiferous mica schist is exposed about one km north-west of Kigga. The garnets are of almandine type. It is also located near Magibailu of Sringeri taluk, Sunkadamane, Kesgod and Deveramane of Mudigere taluk.

### **Bauxite**

Low-grade ferruginous bauxite occurs in the scrap region of the Kemmannugundi iron ore fields of Baba-Budan range. The bauxite horizons range in thickness from 2.5 to 3.5 metres. Below this depth, they grade into ferruginous laterite. The percentage of aluminium oxide ranges from 39 to 58.

### **Clay**

Occurrences of clay, suited for the manufacture of pots and tiles have been found to occur near Hariharapura, Halmatturu and Markalli in Koppa taluk. A plastic yellowish clay occurs on the east bank of the Tunga river opposite Sringeri. Black clay is being mined at Bairapura in Mudigere taluk.

### **Gold**

Gold has been found and worked out to a small extent in this district. It occurs at Tambadihalli, Jalagaragundi, Siddarahalli, Nandi (Hosahalli),

Devarakal, Ajjampura and Bukkambudhi. Extensive old workings are found at these places.

### Limestone

Crystalline limestone is some what rare in this district. There are a few of thin runs of highly siliceous and argillitic limestones between Tarikere in this district and Channagiri in the Shimoga district. Kankar is widespread around Birur, Gulihalli, Kodihalli, Nagadevanahalli, and Timmapura in Kadur taluk.

### Other Minerals

Soapstone is found to occur in Bairagondanahalli and Hochihalli of Kadur taluk. It is being mined at the latter place. Steatite is located at Halanduru, Bemane, Nalluru, Heggarasu, Cholaramane and Begaru of Sringeri taluk. It is generally of a low grade. Granites and granitic gneisses, which occur at several places are being quarried and used as building stones and also as road metal.

Manganese, a low grade ore, occurs at Siddarahalli. Greenish stains of copper carbonate are seen on the conglomerate beds to the north of Chikmagalur. Chromite of a low grade occurs near the villages Bandre, Banuru and Gijikatte in the Tarikere taluk and Kuppalu, Banehalli and Chamenahalli in Kadur taluk. Graphite is found to occur on the scrap of the Baba-Budan range near Hoskan in Chikmagalur taluk. Zinc-blend-ore sphalerite is found to a very little extent along the pyrites and other sulphide-ore minerals, in some of the old workings at Bukkambudhi in Tarikere taluk. These minerals are not of much economic importance.

## FORESTS

The western parts of the district are covered with some of the dense and most useful forests in the country. There is a continuous stretch of valuable forests encompassing the whole of the Jagara valley and most of Koppa and Mudigere taluks. It clothes the hill-sides densely and gives shelter for coffee cultivation. Sholas and hanging woods occupy almost every ravine and hollow tracts of the Baba-Budans. The loftier heights are clothed with much coarse grass, but always bare of trees.

The eastern taluks of Kadur and Tarikere are generally devoid of trees. In the north of Tarikere, the jungles, though not yielding large timber, are valuable as affording a supply of fuel for a poorly wooded neighbourhood. The sandal tree grows on the slopes of the hills leading upto the Baba-Budans from the south and the east.

The types of forests found in the district are (1) Southern tropical wet-evergreen forests, (2) Southern tropical semi-evergreen forests, (3) Southern moist-deciduous forests, (4) Southern tropical dry-deciduous forests and (5) Southern tropical thorn forests. Most of the forests of the

*maidan* areas in Chikmagalur and Kadur taluks have suffered a great deal by over-exploitation, over-grazing and forest fires. The moist deciduous forests and evergreen forests have been preserved considerably and they are catering to the needs of various forest-based industries like ply-wood, slate-frames, packing cases and match wood besides yielding bamboos, firewood and other produce for the use of the general public.

### Forest produce and revenue

The chief sources of forest revenue are the hard and soft woods and sandalwood. There are also other minor forest produces like bamboos, canes, *thangadi* and *Kakke* barks, *tupra* leaves, tamarind, honey wax and *honge* seeds. Timber, which serves many purposes, is also used by the Railway and Defence Departments and also by the Electricity Board. Firewood and charcoal are utilised in several industries. Bamboos are supplied to the paper mills, the medars and also to others. Canes are made use of for rattan works. *Halamaddi* serves as an ingredient in manufacturing *agarbathis*. Sandalwood is in great demand for distilling sandal oil and use by *gudigar* craftsmen for making artistic objects. *Thangadi* and *Kakke* are utilised in tanning, while *tupra* leaves are used in manufacturing beedies. There are Government Forest Depots at Kadur, Lakkavalli, Sangameswarapet, Narasimharajapura, Muttinakoppa, Koppa, Sringeri, Kanekatte and Malleswara in this district. In 1971, the total forest area of the district was about 1,51,641 hectares and by 1979-80, it had been increased to about 1,87,465 hectares (1874.65 sq km) which worked out to 26.04 per cent of the geographical area of the district. The total revenue realised from the forest produce during the year 1976-77 was Rs. 53,95,799.

### FLORA

The charm and economic welfare of Chikmagalur district is, in some measure, dependent on its varied flora. Variety and beauty characterise the vegetation of the district. The rampart of the western ghats which blocks the south-west monsoon clouds from June to September supports rich tropical evergreen forests interspersed by lush grassy slopes on its windward side. On its leeward side, the hills around Mudigere, Aldur and Koppa form a transition zone with semi-evergreen or wet deciduous forests. The Baba-Budan range rises to over 1,600 metres and presents a fine example of peninsular montane vegetation with compact sholas and flower-decked meadows on its higher slopes. By contrast to the east, near Kadur, Birur and Tarikere, the plant cover changes to dry deciduous and thorn scrubs.

#### Tropical Evergreen Forests

(i) *West-Coast Tropical Evergreens*.—The valleys opening on to the western coastal lowlands, when undisturbed, present fine examples of the west coast tropical evergreen monsoon forests. These multi-storeyed forests

form rich wet fragile ecosystems that have reached a climax after millenia of evolution and selection. The closed forest canopy is made up of tall trees with erect unbranched trunks supporting dense spreading crowns that merge with neighbouring trees to form a veritable roof. The crowns are exposed to wind, mist and rain during the monsoon. During the drier months from October to May they filter the tropical sunlight on to the trees, shrubs and herbs growing under their protective shade. *Artocarpus hirsutus* Lam., *Colophyllum elatum* Bedd., *Dipterocarpus indicus* Bedd., *Holigarna grahamii* (Wt.) Kurz, *Lophopetalum wightianum* Arn. and *Vateria indica* L. are common canopy trees. There is a stratum of smaller trees beneath this canopy. Frequent among them are *Cinnamomum malabathrum* (N. Burm) Kostermans, *Elaeocarpus serratus* L., *Harpullia arborea* (Blanco) Radlk, *Persea macrantha* (Ness) Kosterm., *Pterospermum acarifolium* Willd and *Scleropyrum pentandrum* (Dennst.) Mabberley. *Caryota urens* L. is a tall palm in these forests. Among the other palms *Pinanga dicksonii* (Roxb.) Scheffer is shorter and more slender. The coconut-like *Arenga wightii* Griffith is very common and easily noticed because of its short bole and large fronds. A third stratum of shrubs thrives in the subdued light of the forest. *Ixora nigricans* R. Br. ex W & A., *Ixora polyantha* Wt., *Mycetia acuminata* (Wt) Kuntze and *Rhynchosyris permolle* (Nees) Burt prefer this situation. There are also a number of plants from the ginger family growing in the dimly lit forest undergrowth. *Alpinia malacensis* (N. Burm.) Roscoe, *Amomum cannicarpum* (Wt). Benth ex Baker, *Zingiber montanum* (Koenig) Link ex Dietrich are some of these. When autotropism fails parasitism seems to take over. *Aeginetia indica* L., *Balanophora fungosa* J. r G. Forster *Christisonia bicolor* Gard. flower and fruit as total root parasites.

The forest debris and leaf litter support a number of bacteria and fungi which break down the organic matter and return it back to the soil. *Agaricus*, *Coprinus*, *Clavaria*, *Dictyophora* and *Polyporus* are some of the common genera of macro fungi seen in these forests. Besides the plants in the different strata, there are a number of lianas that reach up to the forest canopy. *Bauhinia phoenicea* W & A. *Beaumontia jerdoniana* Wt. *Chone-morpha fragrans* (Moon) Alston, *Entada pusaetha* DC., *Gnetum ula* Brogn., *Moullava spicata* (Dalz.) Nicolson are some of the striking and interesting woody climbers. *Thubergia mysorensis* (Wt.) Anderson often relieves the sombre forest undergrowth by its bright pendulous inflorescence. The tree trunks are clothed with innumerable plants. *Pothos scandens* L. and *Raphiphora pertusa* (Roxb.) Schott and several species of *Peperomia* and *Piper* cling to the forest trees by their climbing roots. During the monsoon epiphytic mosses and ferns flourish on the tree trunks. *Microsorium punctatum* (L.) Copel and *Microsorium membranaceum*, *Pleopeltis nuda* Hooker and *Pyrrhosia ceilanica* (Gies.) Sledge are some of the rhizomatous epiphytic ferns. The delicate lilac of *Utricularia striatula* Sm., the white



of *Impatiens stocksii* Hooker & Thomson and the wet-season flowers of *Sarcanthus pauciflorus* Wt. and *Thunia venosa* Rolfe add to the richness of these forests.

(ii) *Higher Altitude Tropical Evergreens*.—With the increase in altitude the composition of the evergreen forest gradually changes. *Bischofia javanica* Bl., *Canarium strictum* Roxb., *Mesua nagassarium* (N. Burm.) Kostemans, *Myristica dactyloides* Gaert., *Palaquium ellipticum* (Dalz.) Baillon and *Poeciloneuron indicum* Bedd. are some of the useful canopy trees at this elevation. The sub-canopy also may have different constituents. *Cinnamomum macrocarpum* J. Hooker, *Litsea floribunda* (Blume) Gamble, *Symplocos cochinchinensis* (Lour.) Moore and *Syzygium laetum* (Ham.) Gandhi are frequent.

(iii) *Ecological niches*.—There are several ecological niches in these forests. One of these is the montane swamp. *Elaeocarpus tuberculatus* Roxb., producing massive buttress roots, is typical of this niche. *Calamus thwaitesii* Beccari and *Pandanus canarapus* Warburg as well as the white-flowered *Costus speciosus* (Koenig) Sm. inhabit these marshes. Another specialised plant community is found along the mountain streams. *Cyathea gigantea* (Wall ex Hooker) Holttum and *Angiopteris evecta* (Forst) Hoffm., giant ferns with fronds over two metres long, are common. Nestling among the riparian rocks are *Cryptocoryne retrospiralis* (Roxb.) Kunth, *Lagenandra toxicaria* Dalz. and *Osmunda regalis* L. *Calophyllum apetalum* Willd., *Madhuca nerifolia* (Moon) H.J. Lam, *Memecylon angustifolium* Wt. and *Vitex leucoxydon* L.f. are frequent trees along stream banks. The stream bed itself may support *Homonoia riparia* Lour and *Rotula aquatica* Lour., shrubs that can survive long periods of immersion. *Hydrobryum sessilis* (Willis) Engler encrusts the boulders provided the streams are limpid and clear. The stony outcrops in these forests offer another ecological setting for numerous lithophytes. *Ensete superbum* (Roxb.) Cheesm., the wild banana, is a hardy perennial. During the monsoon the dripping rocks are clothed with *Argostemma courtallense* Arn., *Epithema carnosum* Bentham, *Impatiens acaulis* Arn., *Impatiens scapiflora* Heyne ex Roxb. and *Sonerila Wallichii* Benn.

(iv) *Grasslands*.—The evergreen forests are interspersed with grassy slopes. The grass is burnt down during the dry months from February to April. However with the first convectional showers a fresh flush of leaves begins to appear. *Eulalia trispicata* (J. Schultes) Henrard, *Jansenella griffithiana* (C. Mueller) Bor. *Heteropogon contortus* (L.) Pal. Beauv., *Pseudopogonatherum contortus* (Brong.) Camus and *Themeda tremula* (steudal) Hackel are common. *Curculigo orchioides* Gaert. and *curcuma neilgherensis* Wt. produce yellow flowers even before their leaves appear. As the monsoon begins there in a quick succession of ground orchids. *Habenaria grandifloriformis* Bl. & McCann, *Habenaria longicorniculata* Graham and *Habenaria Marginata* Coleb are very common. The most attractive orchid

however is *Platanthera susannae* (L.) Lindl Susan's orchid, especially abundant around Kudremukh. *Hypericum mysurense* W & A is a common yellow-flowered shrub that dots the open grassy slopes.

### Semi-evergreen and Wet Deciduous Forests

(i) The evergreen forests are imperceptibly transformed into semi-evergreen and wet deciduous forests as one moves eastwards from the ghats. *Lagerstroemis microcarpa* Wt. with its smooth whitish stem belongs to this transitional zone. The tropical deciduous forest is characterised by complete leaf-fall during the dry season. Flowers and fruits normally appear during this leafless period which in the wet deciduous forests is short. The canopy is not very compact so that a higher proportion of the sunlight reaches right to the forest floor. *Anthocephalus chinensis* (Lam.) Rich. ex Walp., *Celtis tetrandra* Roxb., *Haldina cordifolia* (Roxb.) Rids., *Hymenodictyon excelsum* wall., *Kydia calycina* Roxb., *Terminalia paniculata* Roxb. *Vitex altissima* L.f. and *Xylia xylocarpa* (Roxb.) Taub are some of the common and useful trees in these forests. Shrubs are numerous. Common among these being *Ardisia solanacea* Roxb., *Clerodendrum viscosum* Vent, *Helicteres isora* L. and *Holarrhena antidysenterica* (Roth) DC., *Argyreia pilosa* Wt. & Arn., *Asparagus gonocladus* Baker and *Strychnos dalzellii* C.B. Clarke are some of the climbers on bushes and trees. During the early rains the terrestrial herbs sprout giving the hooded *Arisaema tortuosum* (Wall.) Schlect., the intriguing *Disperis zeylanica* Trimen or the delicate *Liparis nervosa* Lindl.

(ii) *Epiphytes*.—As the dry season to wet, epiphytic orchids that abound in this region flower in quick succession. The pale flowers of *Dendrobium barbatulum* Lindl. are followed by the orange of *Dendrobium nutans* Lindl. and the pink of *Aerides crispum* Lindl. *Aeschynanthes perrottii* A. DC. and *Hoya ovalifolia* Wt. & Arn. drape the trees with their thick leaves and elegant flowers. The bat-pollinated *Fragraea ceylanica* Thunb, starts its life as an epiphyte but gradually sends roots down to the soil.

(iii) *Seral stages*.—When the original forests are disturbed new plants appear giving rise to secondary formations. *Callicarpa tomentosa* (L.) Murr., *Macaranga peltata* (Roxb.) Muell. and *Trema orientalis* (L.) Bl. are early colonisers of the wet areas. *Bombax ceiba* L. and *Dillenia pentagyna* Roxb. prefer relatively open forest glades. Extensive patches of *Phoenix humilis* Royle occurring between Mudigere and Chikmagalur may represent seral stages of degraded forest land.

### Dry Deciduous and Thorn-scrub Forests

The eastern parts of the district are dry. *Terminalia bellirica* (Gaert.) Roxb. and *Terminalia chebula* Retz., both sources of myrobalans, are frequent but scattered. The Bignoniaceae is represented by *Oroxylon indicum* (L.) Vent., *Radermachera xylocarpa* (Roxb.) Schum. and

*Stereospermum colais* (Dillw.) Mabblerley. *Gmelina arborea* Roxb. and *Tectona grandis* L. f. generally occur as secondary forests. Extensive bamboo brakes may be found especially in the region of Lakkavalli. *Bambusa arundinacea* (Retz.) Roxb. and *Dendrocalamus strictus* (Roxb.) Nees form dense clumps which are being used for paper pulp. The unarmed deciduous trees are replaced by thorny trees and shrubs as the area becomes drier. *Acacia nilotica* (L.) Delile and *Albizia amara* (Roxb.) Boivin herald thorn-scrub forests. When trees are cut the degraded terrain supports shrubs that are protected both against drought as well as browsing. *Argyrea cuneata* (Wild.) Ker. Gamler with its scarlet flowers is very common. *Canthium parviflorum* Lam. forms compact clumps bristling with thorns. *Dodonaea viscosa* Jacq is protected by its resinous leaves. *Andrographis serpyllifolia* (Vahl) Wt. has a stout rootstock from which radiate prostrate shoots with dark rounded leaves. The succulent *Euphorbia antiquorum* L., *Caralluma umbellata* Haw. and *Sarcostemma acidum* (Roxb.) Voigt are typical xerophytes growing on stony exposed hillsides on the eastern limits of the district.

### Peninsular Montane Vegetation

The mountain ranges both at Kudremukh and the Baba-Budan hills reach an altitude of over 1,600 mts. These higher ridges and slopes have a special vegetation of grassy mountain meadows interspersed with compact forest formations termed sholas generally associated with swift flowing cool streams. The shola often fits into a mountain depression and has a low profile that blends with the contours of the hills. The trees especially near the ridges tend to be stunted. Their branches are covered by lichens, mosses and numerous epiphytes. Climbers are few. There is a good ground cover. The cream racemes of *Meliosma pinnata* (Roxb.) Walpers stand out in the sholas in the months of April-May. *Gordonia obtusa* Wt. and Arn. and *Michelia nilagirica* Zenk. gently shed their scented flowers on to the humus laden soil. *Schefflera micrantha* (Cl.) Gamble is a large erect tree different from the other epiphytic Araliaceae. *Bischofia javanica* Bl., *Daphniphyllum neilgherrense* Rosenth. and *Pittosporum neelgherrense* Wt. and Arn. are common at these altitudes. *Vernonia arborea* Ham. is the only tree of Asteraceae found in the district. Several species of *Cinnamomum*, *Litsea* and *Neolitsea* also occur in these sholas. Among the climbers the coppery leaves of *Capparis cleghornii* Dunn ex Gamble and the globose fruits of *Cayratia pedata* (Lour.) Juss. ex Gagn. are quite noticeable. The undergrowth of the sholas harbours the delicate *Viola serpens* Wall. and the white-flowered *Disporum leschenaultianum* D. Don. *Arisaema leschenaultii* Bl. with its caudate spathe comes into flower in May and remains in fruit till August. The ground orchid *Calanthe wightii* Reichb. occurs in profusion in the undergrowth of larger sholas at the peak of the monsoon in July-August.

The grassy meadows afford a quick succession of herbs that appear in short-lived profusion. The slopes that have been burnt during the months of March-April revive with the first convectional showers. *Pancreatium parvum* Dalz. is one of the first to send up a couple of white flowers. The tufts of grasses also produce new shoots so that in a few weeks the charred mountain slopes become green again. *Chrysopogon asper* (Heine) Blatt. and McCann and *Arundinella nepalensis* Trinius are among the tall grasses. *Isachne lisboae* Hooker and *Polypogon monspeliensis* (L.) Desf. are some of the smaller ones. As the monsoon advances, the grassy slopes become veritable carpets of flowers. *Chlorophytum malabaricum* Baker is very common and produces spikes of white flowers. *Habenaria grandifloriformis* Blatt. and McCann *Habenaria longicorniculata* Graham and *Habenaria heyneana* Lindl. follow each other in quick succession. The double-spurred *Satyrium nepalense* Don dots the green slopes with pink spikes. *Oldenlandia stocksii* Hooker and Thomson covers relatively open areas with a fascinating carpet of white and blue. The pointed blue petals of *Gentiana quadrifaria* Blume bloom around midday during the months of September-October. *Swertia corymbosa* (Griseb.) Clarke appears in profusion during the post-monsoon period and is soon replaced by the striking beauty of *Exacum bicolor* Roxb. Nestling among the grasses are *Drosera peltata* J. E. Smith and *Viola patrinii* DC. As the cold season sets in, the perennial shrubs start flowering. On stony ground *Lepidagathis spinosa* Wt. ex Nees sprouts cream-coloured spikes. The total root-parasite *Striga gesnerioides* (Willd.) Vatke is commonly associated with this plant. The most frequent shrubs on the hillsides are *Hypericum mysurense* Wt. and Arn. and *Pleocaulus sessiloides* (Cl.) Bremekamp. The rocks on the ridges often host many plants among which are the Pteridophytes *Cripsinus montanus* Sledge and *Botrychium lanuginosum* Wall. ex Hooker and Grav.

## FAUNA

The fauna is rich and varied in this district which has tropical evergreen, moist deciduous and dry forests.

### Mammals

Mammals including those animals that produce milk are homoiothermal (maintain constant body temperature) and have a single bone in the lower jaw. They occupy the highest place in the animal kingdom chiefly because of the superior organization and complexity of their brain structure. Major group of Indian mammals, i.e., cats, civets, mongooses, dogs, otters bears, bats, monkeys, elephants, bison, antelopes, rodents, etc., are well represented in the district.

### Cat tribe

Tigers (*Panthera tigris*) and leopards (*Panthera pardus*) are found in the forests of the district. The former are found in heavier forested areas and

prey upon the wild hoofed animals and occasionally on domestic animals. Leopards, on the other hand, are relatively in large number and prey upon smaller deer, pigs and rodents, village dogs and other smaller domesticated animals. The jungle cats (*Felis chaus*) are a little bigger than the domestic cats. They feed on smaller rodents and birds.

#### **Civet**

The civets are closely related to the cat tribe. They have narrow pointed muzzles, long bodies and short legs. The Indian civets (*Viverricula indica*) are met within the district. They shelter in holes or under rocks or under bushes, often near villages. They seek their food at night, preying upon rats, squirrels, small birds and the like.

#### **Mongoose**

A long body, short limbs, bright eyes, a sharp snout and trailing bushy tail are the characteristics of the mongooses. Two species of mongooses are commonly seen in this district; they are the Indian brown mongoose (*Herpestes fuscus*) and the stripe-necked mongoose (*Herpestes vitticollis*). The former prefers scrub jungles for its habitat. It takes shelter in bushes, hollows of trees and holes in the ground. It eats small rodents, snakes, lizards, wild birds, centipedes, etc., and fruits and roots. The stripe-necked mongoose prefers forests, where it preys on small rodents, birds, reptiles and ground-dwelling invertebrates.

#### **Hyena**

Hyenas resemble the dog family in general appearance and build. Their legs and feet are typically those of a dog; but the structure of the skull, the teeth and other points of the anatomy are more like that of the cat family. The type of hyena scientifically called as *Hyaena hyaena* is found in this district. It frequents the cultivated areas and lies hidden in caves, holes and hollows during the day. It is mostly active at night and is a well-known scavenger, living chiefly on animal carcasses. Occasionally, it may carry off dogs, goats or sheep from the vicinity of villages.

#### **Dog tribe**

The members of the dog tribe found in the district are the wolf, jackal, fox, wild dog and otter.

#### **Wolf**

The wolf (*Canis lupus*), seen in the forests of the district is a large dog-like animal. It prefers a more bare and open region for its habitat and lies in fields or patches of scrub. It hunts by day as well as by night and mostly preys upon young ones of the bigger hoofed-animals and larger rodents.

#### **Jackal**

The jackal (*Canis aureus*), which is commonly met with in the district, shelters in holes in the ground among ruins or in dense grass. Its eerie

howling is heard at dusk or just before dawn. Jackals go about singly, in pairs or in small packs in search of food. They feed on sugarcane, melons, small berries and also prey on small animals.

### **Fox**

The Indian fox (*Vulpes bengalensis*) lives in burrows dug by itself in open ground or in scrubs. It is active during nights and preys upon small mammals and reptiles, and also turns vegetarian on occasions.

### **Wild dog**

The Indian wild dog (*Cuon alpinus*) resembles very much the domestic dog, but has shorter legs and muzzle. It preys upon young ones of larger hoofed-animals.

### **Otter**

The common otter (*Lutra lutra*) is also found in this district. It varies in colour from blackish to tawny brown. Fish is its staple food, and in hunting for them, families of otters may combine.

### **Bear**

The sloth bear (*Melarsus ursinus*) is seen in forests of the district. It has distinctive shaggy coat and long snout. This animal prefers areas where out-croppings of rocks and tumbled boulders offer shelter. Fruits are its main food.

### **Bat**

As many as thirty varieties of bats are found in this district. They are flying mammals and are most easily identified. They are nocturnal and carry destructive raids on fruit trees and orchards.

### **Monkey**

There are two types of monkeys commonly found in the district. (1) Hanuman langur which has a black face, ears and soles and usually found in the forest and semi-urban surroundings. They live mainly on fruits, flower buds and leaves. (2) The other is the familiar Bonnet monkey (*Macaca radiata*) with a smaller body size and reddish brown in colour. Its habitat is also the same but it is frequently found in towns also. This causes a greater damage to fruit trees and orchards. Both live in troops and religious sentiment tolerates them to a considerable extent.

### **Elephant**

The elephant (*Elephas maximus*) is occasionally met with in Kigga, Muttodi and other remote heavily wooded parts of the areas. Sometimes, they play havoc with crops like sugarcane, paddy, etc. The Forest Department in the district maintains a few tamed ones for carrying timber. In 1894-95 a stockade was formed at Hebbe to capture elephants; but the animals went to Sakreail in Shimoga district, where they were caught.

Three wild elephants roaming about freely and causing havoc to agricultural crops, particularly, sugarcane, paddy and arecanut were captured by "Mini-Khedda" operation in 1973 near Hunasaghatta in Tarikere taluk. Later on, they were taken to the elephant camp at Sakrebail. At times stray elephants are being driven away or captured by the Forest Department.

#### Bison

The bison (*Bos gaurus*) is found in some of thickets of forests of the tract. It grazes early in the mornings, and then during hot hours, it retires to shady spots in the seclusion of the forests. Its food is chiefly grass, but sometimes, it browses on leaves also.

#### Deer tribe

Of the deer tribe, spotted deer (*Axis axis*), which is the most beautiful in build and colouration, is now less numerous than it used to be. The barking deer (*Muntiacus muntjak aureus*), which derives its popular name from its well-known cry, which at a distance resembles the single bark of a dog, is also present in this district. The Sambar (*Cervus unicolor*), perhaps the largest of the deer tribe found in India, is also seen in some of the forests of this area.

#### Rodents

Numerous species of squirrels, hares, porcupines, mice and rats are found in the district, both in the open cultivated areas and in the forests. They are easily distinguished from all other mammals by the presence of two large incisors separated by a large gap from the grinding teeth. They are known for their destruction of crops and fruits.

Of squirrels, the flying squirrel (*Petaurista philippensis*), which is nocturnal in its habits, the Indian giant squirrel (*Ratufa indica*), which lives in summits of high trees and makes loud rattling call, and the northern palm squirrel (*Funambulus pennati*), which makes a low chirping call, are worth a special mention. The Indian hare (*Lepus nigricollis*), and the Indian porcupine (*Hystrix leucura*) are also commonly seen. The house rat (*Rattus rattus*), the house mouse (*Mus musculus*), the little Indian field mouse (*Mus booduga*), the Indian bush rat (*Golunda ellioti*), the lesser bandicoot rat (*Bandicota bengalensis*), the large bandicoot rat (*Bandicota indica*), the Indian long-tailed tree mouse (*Vendeleuria oleracea*), and soft-furred field rat (*Millardia melitana*) are also found in this district.

#### Other mammals

The Indian wild boars (*Sus scrofa*), which are found in this district, live in grass or scrub jungles or in forests and are destructive to crops. They are omnivorous, living on crops, roots, tubers, insects, snakes, offal and carrion. The house shrew (*Suncus murinus*), and the Savi's pygmy shrew (*Suncus etruscus*), are also seen in this area. They are sometimes mistaken for rats. Their soft grey fur and long snout are distinctive. They are beneficial

as they feed largely on noxious insects and are also intolerant of rats in their territory. The Indian Pangolin (*Manis crassicaudata*), is also occasionally found. Its body is covered by scales, and its jaws are toothless. It feeds on ants, termites and their eggs. It moves slowly, and rolls up into a ball when frightened.

### Birds

The Avifauna are abundant and varied in this district. The availability of a large supply of insects and vegetable food in the forests of the district supports rich bird life. The species of birds that live in or near water for food and protection are chiefly the herons, storks (*Ciconia ciconia*), Spotbill ducks or grey ducks (*Anas poecilorhyncha*), common teals (*Anas crecca*), etc. Among the birds of prey, eagles, hawks, kites (*Milvus govinda*), vultures (*Gyps bengalensis*) and owls are commonly met with in the district. The district is also noted for game birds such as the tree pie (*Depdrocitta vagabunda*), the jungle crow (*Corvus macrorhynchos*), the grey tit (*Parus major*), the yellow-cheeked tit (*Macrolophus haplonotus*), parakeet (*Psittacula columboides*).

In addition, the green pigeon (*Crocopus chlorogaster*), the rock pigeon (*Columbia intermedia*), the partridge (*Francolinus pondicerianus*), the myna (*Acridotheres tristis*), the tailor bird (*Orthotomus sutor*), which sews its nest with fibres and leaves, the sparrow (*Passer domesticus*), the king fisher (*Alcedo atthis*), the wood-pecker (*Micropternus brachyurus*), the jungle fowl (*Gallus sonneratti*), the pea-fowl (*Pavo cristatus*), the wild dove, the quail (*Coturnix coromandelica*), the cuckoo (*Eudynamis honcrata*) and the bulbul (*Chloropsis rauvouis*) are also found in this district.

### Reptiles

Reptiles are cold-blooded scaly animals which breathe by their lungs. A fairly tropical climate and a rich supply of insect food support quite an abundance of reptilian life in this district. Reptiles include snakes, crocodiles, lizards, etc. Among the poisonous snakes, the most venomous and most dreaded King Cobra (*Uphiophagus hannah*), the Indian Cobra (*Naja naja*), the pit viper (*Trimeresurus gamineus*) and the Krait (*Bangarus caleruleus*) are found here. The common green whip snake (*Ahaetulla nasutus*), which is popularly believed to strike at the eyes, the coral snake (*Callophis nigrescens*), which is easily recognized by its blackish or greenish blue skin above with three to five black stripes, the wolf snake (*Lycodon travancoricus*) which has an enlarged tooth both in the upper and lower jaws resembling the canine teeth in wolves, the green keelback (*Macropisthodon*), which has bright grass green scales above and the python (*Python molurus*), which is the largest among Indian snakes are also seen in this district.

The crocodiles (*Crocodylus palustris*), are found in river beds. Lizards are in great abundance and variety, particularly the common garden lizard



(*Calotes versicolor*), the common house gecko (*Hemidactylus brookei*) and the giant gecko (*Hemidactylus giganteus*).

### Amphibians

As a class, the amphibians are less numerous than any of the foregoing groups and fishes. But they are biologically interesting in that their internal organization discloses a piscine descent and in turn they have been the ancestors of reptiles. There are many varieties of frogs in this district such as the burrowing frog (*Rana breviceps*), the skipping frog (*Rana cyanophlyctis*), the paddy-field frog (*Rana Limnocharis*), the bull frog (*Rana tigrina*), the bush frog (*Philautus variabilis*), the tree frog (*Racophorus maculatus*), the common Indian toad (*Bufo melanostictus*), etc.

The limbless amphibians are worm-like burrowing caecilians mainly occurring in the hilly rainfed regions of the *malnad* areas. Five species belonging to three genera are known from South India. Of these *Ichthyophis* has been generally reported from places like Sringeri, Jayapura, Kottigehara, Mudigere, etc. This species is known to occur in varied habitats like the banks of rivulets, road cuttings, decaying timber logs and even decomposing dung heaps.

### Fishes

Fishes are abundant in both rivers and tanks. The finest fish are found in the Tunga and the Bhadra rivers and in the Madagakere and the Ayyanakere. In holy places like Sringeri, situated on the banks of rivers, fishes of the rivers are fed by pilgrims. The fishes there have become so tame that a call brings them in hundreds to the surface. A few of these are even adorned with jewellery, such as nose-rings or ear-rings, and ornaments fastened to their tails. There are about fortyfour types of species of fishes found in this district. The principal fishes are carps, cat fishes, murrels, eels and other varieties (see also ch. IV).

### Domestic animals

The cattle of the district generally are poor in size and of inferior breed. The climate of the *malnad* is not quite favourable to them. The hardy buffalo (*Bubalus bubalis*) favours a moist climate. The other common domestic animals of the district are the horse (*Equus caballus*), sheep (*ovis* sp.), goat (*capra* sp.) etc.

### Other animals

There are many varieties of invertebrates in this district. Three kinds of scorpions, namely, the large black rock-scorpion, the large red field-scorpion and the little red house-scorpion are found here. Leeches are numerous and active during the rainy months. There are about 13 types of spiders in this district. Spiders of immense size are found in the bamboo jungles on the banks of the Bhadra river.

### **Bhadra Wild Life Sanctuary**

There is a wild life sanctuary in the district named "The Bhadra Wild Life Sanctuary". It covers an area of 492 square km and is divided into two wings called Muttodi wing and Lakkavalli wing. The Muttodi wing was previously called "The Jagara Valley Wild Life Sanctuary". It has animals of various types such as bison, elephant, tiger, panther, sambar, spotted deer, barking deer, wild boar, porcupine, bear, wild dog, black and brown monkeys, birds like pea-cock, wild-fowl, parrot, partridge, pigeon, etc., and reptiles such as cobra, python and other kinds of snakes. The sanctuary has good forests with lofty trees such as teak, rosewood, sandalwood, *beete*, *honne*, *nandi*, *mathi*, etc. As the sanctuary is surrounded by hills, a number of tributaries of the Bhadra river flow inside the sanctuary. Fodder is also available in plenty. The wild life here has a favourable climate throughout the year.

The special feature of the location of this sanctuary is that its western border abuts the backwater of the Bhadra reservoir. There are 150 km of roads inside the sanctuary maintained by the Wild Life Preservation Sub-division. The visitor can enjoy the sight of the wild animals either by walk or in a vehicle. The Forest Department is maintaining lodges at Kesave, Kemmannugundi, Sukalhatti and Kowlapur.

### **CLIMATE**

The climate of this district, a greater part of which has hilly terrain, is, on the whole, very agreeable and cool. The cold season from December to February, which is one of clear bright weather, is followed by the hot season from March to May. The period from June to September constitutes the south-west monsoon season. October and November may be termed the post-monsoon or retreating monsoon season.

### **Temperature**

There is a meteorological observatory in the district at Balehonnur, and the records of this observatory may be taken as representative of the meteorological conditions in the district in general. There is rapid increase in temperature after February. April is generally the hottest month with the mean daily maximum temperature at 30.7° C (87.3° F) and the mean daily minimum at 19.0° C (66.2° F). Nights in May are, however, slightly hotter than during April. On individual days during the summer, the day temperature reaches 36° C (96.8° F) occasionally, and the days are at times sultry due to high humidity.

With the onset of the monsoon in the district early in June, there is an appreciable drop in the day temperature, but the drop in the night temperatures is only slight. The day temperatures begin to increase after September. However, the nights become progressively cooler after September.

While the day temperatures are the lowest during the south-west monsoon season, night temperatures are the lowest in the cold season. The highest maximum temperature recorded at Balehonnur was 35.6° C (96.1° F) on 1st May, 1959. The lowest minimum was 8.3° C (46.9° F) on 9th December, 1937.

### **Humidity**

The humidity is very high during the monsoon season, generally exceeding 90 per cent. It is comparatively less during the rest of the year, the driest part of the year being the period from January to March, particularly in the afternoons.

### **Cloudiness**

During the monsoon season, the skies are mostly heavily clouded or overcast. Cloudiness decreases during the post-monsoon period. The skies are mainly clear or lightly clouded during the period from January to March. From April onwards, cloudiness increases, the afternoons being more cloudy usually.

### **Winds**

Winds are generally very light. During the period from May to September, winds blow predominantly from directions between south-west and north-east. In the rest of the year, the winds blow mostly from the south-east.

### **Special weather phenomena**

Thunder-storms occur in the summer season and the post-monsoon season. Fog occurs on many days in the cold season in the western parts of the district. Even in the monsoon and post-monsoon seasons, the hilly regions are often enveloped in cloud or mist.

### **Rainfall**

The details of rainfall as recorded in several raingauge stations of the district and for the district as a whole are given in tables I, II and III. The average annual rainfall in the district is 1,989.8 mm (78.34"). The rainfall is heavy in the south-western portions of the district near the western ghats. It decreases very rapidly towards the north-east. The large spatial variation in the rainfall in the district will be evident from the fact that Sringeri near the western border gets as much as 3,695.1 mm (145.48") in a year, while Kadur in the eastern part of the district receives only 603.6 mm (23.76") in a year.

About 79 per cent of the annual rainfall in the district is received during the monsoon months, i.e., from June to September, July being the rainiest month generally. Some rain is received in the pre-monsoon months of April and May, and in the post-monsoon season. In the region to the north of Mudigere and to the east of the Bhadra river, the rainfall in the

post-monsoon season is more than in the latter half of the south-west monsoon season. The variation in the rainfall from year to year in the district is small.

In the 50-year period from 1901 to 1950, the highest annual rainfall in the district, which was 135 per cent of the normal, occurred in 1946. The lowest annual rainfall amounting to 66 per cent of the normal was received in 1918. In the same 50-year period, the annual rainfall in the district was less than 80 per cent of the normal in four years only, none of them being consecutive. However, considering the annual rainfall at the individual stations in the district, two consecutive years of such low rainfall occurred thrice at Kadur, and once each at three out of the seven remaining stations. Even three consecutive years of such low rainfall occurred once at Koppa in these 50 years.

It will be seen from Table II that the annual rainfall in the district was 1,700 and 2,200 mm (66.93" and 86.61") in 29 years out of 50 years. On an average, there are 92 rainy days (i.e., days with rainfall of 2.5 mm = 10 cents or more) in a year in the district. This number varies from 122 days at Balehonnur to 42 at Kadur. The heaviest rainfall in a day recorded at Kudromukh Project site was 360.68 mm on 26th July 1974.

The traditional way of calculating rainfall on the basis of 27 *Nakshatra periods* (stars) is being followed even to-day in all parts of the district. These *nakshatra* periods divide the solar period corresponding to 27 stars of the Indian astronomical calendar, beginning with Aswini (the first star) of the constellation Aries (*Mesha*) and ending with Revati (the last star) in the constellation Pisces (*Meena*).

TABLE 1  
Normal and Extremes of Rainfall

Station	No. of years of data	January	February	March	April	May	June	July	August	September	October	November	December	Annual	Annual rainfall as % of normal & year * *		Heaviest rainfall in 24 hours	
		3	4	5	6	7	8	9	10	11	12	13	14	15	High-est	Low-est	Amt. (mm)	Data
Bahelonnur	22 a	2.0	2.8	21.8	90.4	119.1	401.8	895.9	593.1	231.7	194.6	67.6	11.7	2,632.5	139	75	219.2	1953
	b	0.3	0.2	1.3	6.3	7.7	20.8	28.1	24.3	16.9	10.6	4.5	0.8	121.8	(1946)	(1945)		July 2
Chikmagalur	50 a	5.3	5.3	13.2	55.4	122.4	106.2	187.5	92.5	86.1	153.9	72.4	21.6	921.8	159	55	120.7	1953
	b	0.4	0.3	0.9	3.8	7.4	8.9	13.2	9.0	6.3	8.7	4.6	1.2	64.7	(1946)	(1929)		Oct. 15
Kadur	50 a	3.8	3.8	7.4	29.7	33.3	54.9	82.3	49.8	65.3	140.5	65.8	17.0	603.6	192	48	127.0	1876
	b	0.4	0.3	0.7	2.4	4.9	4.5	7.5	4.0	4.4	7.6	4.1	1.2	42.0	(1932)	(1908)		June 2
Koppa	50 a	4.6	4.8	7.9	51.6	85.6	479.5	1,189.5	684.0	247.4	172.5	62.2	13.5	3,003.1	151	58	311.4	192
	b	0.2	0.3	0.8	4.2	5.5	20.6	27.7	25.4	15.1	9.0	3.5	.9	113.2	(1923)	(1918)		Aug. 7
Mudigere	50 a	4.1	3.3	12.5	65.8	110.7	417.3	820.2	425.2	204.7	189.0	66.8	19.1	2,339.2	145	67	292.1	1924
	b	0.5	0.4	1.0	4.6	7.5	19.2	25.6	22.9	15.4	11.3	4.9	1.1	114.4	(1947)	(1938)		July 14
Narasimha- rajapura	50 a	2.5	3.8	10.2	51.1	91.2	254.8	675.9	369.3	147.1	150.6	51.8	13.7	1,822.0	161	66	225.0	1923
	b	0.3	0.3	0.7	3.8	5.6	16.2	25.2	22.4	11.7	8.2	3.4	0.9	98.7	(1923)	(1905)		July 11
Sringeri	50 a	4.6	1.5	8.6	47.0	83.6	692.4	1,451.6	849.4	292.3	183.9	61.7	18.5	3,695.1	147	68	296.2	1953
	b	0.3	0.1	0.7	3.6	5.1	21.4	28.2	26.4	15.6	9.5	4.0	1.2	116.1	(1923)	(1918)		July 6

CHIKMAGALUR DISTRICT

TABLE 1 (contd.)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Tarikere	50 a	3.6	4.6	4.6	38.3	76.2	86.6	240.5	142.0	87.9	135.4	61.5	16.0	900.2	154	58	138.2	1923
	b	0.3	0.2	0.4	2.8	5.0	8.5	15.9	13.4	7.5	7.7	3.5	0.9	66.1	(1932)	(1945)		July 10
Chikmagalur	a	3.8	3.7	10.8	53.7	96.5	311.7	693.0	400.7	170.3	165.1	64.1	16.4	1,989.8	135		66	
(Dist)	b	0.3	0.3	0.8	3.9	6.1	15.0	21.4	18.5	11.6	9.1	4.1	1.0	92.1	(1946)	(1918)		

(a) Normal rainfall in mm. (b) Average number of rainy days (days with rain of 2.5 mm or more). \*Based on all available date upto 1957. \*\*Years given in brackets.

Source: The Deputy Director General of Observatories (Climatology and Geophysics), Poona. One inch of rainfall—2.54 centimetres.

TABLE 2

## Frequency of Annual Rainfall in the District (Data 1901-1950)

Range in mm.	No. of years	Range in mm	No. of years
1301—1400	2	2001—2100	1
1401—1500	0	2101—2200	3
1501—1600	3	2201—2300	3
1601—1700	5	2301—2400	3
1701—1800	8	2401—2500	2
1801—1900	8	2501—2600	1
1901—2000	9	2601—2700	2

TABLE 3

Statement showing the annual rainfall recorded in taluk headquarters towns of Chikmagalur district (in millimetres) from 1956-1979

Taluk	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
Chikmagalur	906.3	1,154.4	1,181.4	1,309.9	822.8	1,034.8	932.8	802.5	855.0	523.5	886.7
Kadur	682.0	763.3	491.1	819.3	713.8	567.1	815.6	502.1	574.2	277.7	629.4
Koppa	3,848.6	3,180.1	3,610.4	4,147.0	2,856.6	4,271.3	3,492.8	2,716.1	2,827.0	2,373.1	2,046.7
Mudigere	2,649.0	2,215.6	2,325.7	3,490.3	2,252.6	4,342.1	3,004.0	1,726.6	2,960.4	1,863.2	1,964.4
Narasimharajapura	2,161.5	1,919.7	1,962.8	2,340.6	1,598.0	2,203.5	2,342.2	1,480.4	1,989.5	1,314.8	1,386.0
Sringeri	4,295.1	4,295.1	4,780.6	5,118.9	3,684.7	5,963.2	4,831.8	3,538.8	3,685.8	3,068.9	2,837.5
Tarikere	1,492.5	789.4	896.4	1,093.3	1,242.1	953.0	1,313.7	772.0	864.4	597.2	811.2

Taluk	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Chikmagalur	711.4	734.9	674.8	601.0	631.7	562.9	542.4	632.6	874.3	455.6	925.3	864.0
Kadur	329.0	597.7	579.0	527.2	608.0	616.7	497.9	750.8	806.2	543.7	935.0	565.1
Koppa	2,868.8	2,802.1	3,344.3	3,470.1	3,081.4	2,657.4	2,786.4	2,372.8	3,164.4	2,096.4	2,446.1	4,625.9
Mudigere	2,649.4	1,918.1	2,405.0	2,096.1	2,113.6	1,914.5	2,287.4	2,106.7	2,148.4	2,133.1	2,963.4	3,507.3
Narasimharajapura	1,522.3	1,465.5	1,725.0	1,794.9	1,763.7	1,263.9	1,608.6	1,423.9	1,732.9	1,195.8	2,357.0	3,076.5
Sringeri	4,326.3	4,024.9	4,110.9	4,525.8	4,204.9	3,485.9	4,001.4	3,771.6	4,766.6	3,689.1	2,997.7	3,732.8
Tarikere	668.4	593.9	806.3	877.2	551.8	1,275.4	799.6	647.1	1,077.2	416.2	908.4	874.1

Sources: District Statistical Officer, Chikmagalur. Census Hand-Book of Chikmagalur District, 1961 Revision settlement Report — Zone II and III, 1965.

**TABLE 4**  
**Normals of Temperature and Relative Humidity**

(BALEHONNUR)

Month	Mean Daily Maximum Temperature °C	Mean Daily Minimum Temperature °C	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity	
			°C	Date	°C	Date	0830* %	1730* %
January	27.2	14.8	32.8	1953 Jan 28	10.0	1946 Jan 11	76	Data
February	29.1	15.7	33.1	1961 Feb 23	11.1	1940 Feb 1	80	not
March	31.2	17.4	35.0	1949 Mar 23	12.2	1940 Mar 12	81	available
April	30.7	19.0	35.0	1950 Apr 17	13.9	1952 Apr 30	86	
May	29.4	19.6	35.6	1959 May 1	15.6	1952 May 8	87	
June	24.9	18.9	32.8	1953 Jun 6	15.6	1943 Jun 30	91	
July	22.8	18.6	29.1	1960 Jul 18	13.9	1955 Jul 9	93	
August	23.3	18.6	29.4	1947 Aug 15	16.1	1951 Aug 27	94	
September	24.4	18.1	30.6	1936 Sep 22	13.3	1935 Sep 24	93	
October	26.2	17.9	29.4	1959 Oct 20	12.8	1952 Oct 31	91	
November	26.2	16.3	29.4	1951 Nov 4	10.0	1934 Nov 10	84	
December	26.2	14.9	30.0	1945 Dec 23	8.3	1937 Dec 6	77	
Annual	26.8	17.5					86	

\* Hours - I. S. T.



TABLE 5  
Mean Wind Speed in Km/hr  
BALEHONNUR

Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Annual
5.1	4.2	4.2	3.7	3.5	3.9	5.6	4.2	3.5	3.1	3.7	4.3	4.1

TABLE 6  
Special Weather Phenomena  
BALEHONNUR

Mean No. of days with	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual
Thunder	0.4	2.2	5.4	11.6	12.4	2.4	0.4	0.6	4.4	7.2	2.2	0.6	49.8
Hail	0.0	0.0	0.6	0.8	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
Dust-storm	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Squall	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4
Fog	8.8	11.8	10.6	12.0	6.8	6.6	7.2	5.2	11.6	14.4	12.2	3.8	111.0