

SOUTH KANARA DISTRICT

CHAPTER I

GENERAL

THE district of South Kanara is situated on the Western Coast of India, about half way between Bombay and Cape Comorin. From north to south, it is a long narrow strip of territory and from east to west, it is a broken low plateau which spreads from the Western Ghats to the Arabian Sea known in Kannada as 'Pashchima Samudra' (Western Sea). The major part of its length lies along the seaboard. The area is intersected by many rivers and streams and presents a varied and most picturesque scenery. Abundant vegetation, extensive forests, numerous groves of coconut palms along the coast and rice fields in every valley, provide a refreshing greenness to the prospect. It is a most densely inhabited tract.

The district forms the southern of the two coastal districts of the new Mysore State, which are known as South Kanara and North Kanara. The name 'Kanara' (which was formerly spelt as 'Canara') is derived from 'Kannada', the name of the regional language of the State. It appears that the Portuguese, who, on arrival in this part of India, found the common linguistic medium of the people to be Kannada, and accordingly called the area as 'Canara', 'd' being not much in use in Portuguese. This name applied to the whole coastal belt of Karnataka and was continued to be used as such by the British. When this 'Canara' coast was divided into two parts in 1860, this southern area was called South Kanara and the part lying to the north of it was termed North Kanara. In Kannada, they are known as "Dakshina Kannada Jille" and "Uttara Kannada Jille" respectively.

The area is alluded to as Tulu-nadu (*nadu* means a territorial unit) in *Agananuru*, a Tamil Sangam anthology of the early

centuries of the Christian era¹. There is a reference to *Tulu-vishaya* in the Barakuru inscription (S.I.I., Vol. VII, No. 327) of the period of Bankideva I of the Alupa dynasty. Lithic records of the Vijayanagara rule mention the region as *Tulu-rajya* and *Tulu-desha* and parts of it as *Mangalooru-rajya* and *Barakuru-rajya*.

Varying theories

Though Kannada has been in general use in the area, both as the official language and popularly cultivated link language since time immemorial, the native tongue of a large number of people in a major portion of the district is Tulu of the Dravidian family of languages, more akin to Kannada. 'Tuluva' denotes the people or area speaking Tulu. There are varying theories about the origin of the word 'Tulu'. A version traces the origin to a legendary ruler called Rama Bhoja, who is supposed to have made many gifts like *tula-dana*, *tula-purusha*, etc., and since he gave these gifts, his dynasty came to be known as the 'Tolar' line, and the region 'Tulu'. This was rejected by Dr. B. A. Saletore as unhistorical and untenable. Another view attempts to derive it from the word 'Tuluve', which means in Tulu 'mild and meek' and it was interpreted as denoting "the peaceful demeanour of the people." But Dr. K. V. Ramesh has pointed out that in the Tulu language as spoken today when this word qualifies certain fruits, it signifies the softness of the fruits, for instance, *tuluve palakkayi* means 'soft jack fruit' and similarly *tuluve kukku* means 'soft mango'. So, Dr. Ramesh holds the view that in the ancient days too, the region must have been famous for its variety of soft fruits and might have, therefore, come to be called 'Tulu-nadu' outside its own bounds as a mark of distinction².

M. Govinda Pai seems to opine that there would be some meaning in the derivation of the word from softness, if softness is taken as an attribute not of the people but of the soil of the regions³. It is also said that the word 'Tulu' may be connected with the original Dravidian term of *turu*, which means cattle, and that the Tuluvas in ancient times were cattle-breeders. Dr. Guru-rajya Bhatt suggests that the community of 'Turvasas' or 'Turuvas' might have been called 'Tuluvas.'⁴

According to Dr. B. A. Saletore, the word 'Tuluva' might be traced to the Kannada verbal root *tulu*, which means "to attack", thereby signifying the nature of the ancient Tuluva people whose war-like activities in the early period of history might have secured for them that appellation. Ample evidence, according to the same

-
1. Dr. K. V. Ramesh, "A History of South Kanara", p. xiii.
 2. Dr. K. V. Ramesh, *op.cit.* pp. xxv and xxvi.
 3. "Tenkanadu", p. 19.
 4. "Antiquities of South Kanara", p. i.

author, can be gathered from their games to establish their claims for martial activities in the past. He says that the whole trend of events from the early centuries of the Christian era down to the sixteenth century, and especially the rise of an important principality, which lasted for a long time, attest to the "war-like nature" of the Tuluva people in historical times¹. There is yet another theory which is also supported by M. Govinda Pai, which suggests the derivation of the name from the word "Tulu" meaning to "row or ply" in water. The early maritime activities of the people of the area and the fact that they have been good seafarers, since a very long time, lend support to this view. Shri Sediypu Krishna Bhat, however, opines that the word "Tulu" denotes water and, therefore, the name Tulunadu means a region which abounds in water².

Geographically, the South Kanara region is separated from the rest of the South Indian peninsula by the towering heights of the Western Ghats. It spreads from the Western Ghats towards the sea to the west. The length of the coast-line, which is almost straight, but broken at numerous points by rivers, rivulets, creeks and bays, is 76 nautical miles (140.8 Kms.). The district lies between 12°27' and 13°58' north latitude, and 74°35' and 75°40' east longitude. It is about 110 miles (177 kilometres) in length, about 25 miles (40 kilometres) broad at its narrowest and about 50 miles (80 kilometres) at its widest part. In several respects, it shares the geographical and economic characteristics of its contiguous districts of Coorg, Shimoga, Chikmagalur, etc.

Location

The district, which is a long and narrow strip of territory, is bounded on the north by the North Kanara district, on the east by the districts of Shimoga, Chikmagalur, Hassan and Coorg, on the south by the Kasaragod taluk, which is at present in Kerala State, and on the west by the Arabian Sea. In the north, particularly in the Coondapur taluk, the Western Ghats are nowhere more than 25 miles (40 kilometres) from the sea and at one point there is an extent of only six miles (about 10 kilometres) of plain land and it is here that the northern boundary of this district and the southern boundary of the North Kanara district meet.

General boundaries

The geographical area of the district, as computed by the Surveyor-General of India and cleared by the Central Statistical Organisation of the Government of India, is 8,436 sq. kilometres (or 3,257 sq. miles). But the reporting area of the district for land utilisation purposes, as worked out by the Commissioner for Survey, Settlement and Land Records in Mysore, Bangalore, is

Area and population

-
1. "Ancient Karnataka", Vol. I, pp. 4-9.
 2. *Vide* his series of articles on the subject in the "Udayavani" of Manipal published in May 1973.

8,158.5 sq. kilometres (or 3,150 sq. miles). This difference is due to the different methods employed by them in measuring the area. The population of the district, according to the 1971 census, was 19,39,315 as against 15,63,837 in 1961, thus registering a decennial growth rate of about 24 per cent. A special feature of this district's population has been that it has more females than males. While there were 9,42,495 males in the district in 1971, the number of females was 9,96,820, *i.e.*, 54,325 more than the males. In terms of area, it has the twelfth place among the districts of the State, but in respect of population, it occupies the sixth place. It is one of the most thickly populated districts of the State, the density of its population being 230 per sq. kilometre in 1971 as against the State average of 153. It accounts for 4.4 per cent of the total area and 6.62 per cent of the total population of the State (*see* also Chapter III).

History of the district as an administrative unit

The Alupas ruled the area from an early period of the Christian era to the end of the fourteenth century A.D. The kingdom was divided into divisions called *nadu* and the region around Baindoor in Coondapur taluk was known as Bayindura-*nadu*, while the region around Mangalore was called Mugaru-*nadu*. For a short period, the region was under the suzerainty of the Hoysalas, after which, from about the middle of the fourteenth century to the end of the sixteenth century, the district formed a part of the Vijayanagara Empire. As has been already mentioned, the region was divided into two administrative units called Barakuru-*rajya* and Mangaluru-*rajya*, with Barakuru in the present Udipi taluk and Mangalore for their respective headquarters. The two *rajyas* were generally placed under the charge of two governors. Sometimes, however, there was a single governor for both the *rajyas*. The region was further sub-divided into smaller administrative units known as the *nadus*. There are references in Vijayanagara inscriptions to Paduvakona-*nadu*, Bayindura-*nadu*, Udayangala-*nadu*, Tilugadiya-*nadu*, Kadaba-*nadu*, Nalvatta-*nadu*, Haru-*nadu*, Mungi-*nadu*, Vandalakeya-*nadu*, Kantarada-*nadu*, Kabu-*nadu*, Khande-*nadu* and Bandampalli-*nadu*.*

The administration of the region of South Kanara was transferred to the Keladi rulers by the Vijayanagara emperor around 1554 A.D. and it was under the sway of the Keladi Nayakas for about two centuries. With the capture of Bednur (Bidanur) by Haidar Ali in 1763 A.D., the region of South Kanara also passed into his hands and after him into the possession of Tipu Sultan. It was annexed by the British in 1799 A.D. on the fall of Srirangapatna. Under the British, both South and North Kanaras formed one district in the Madras Presidency for sometime. They were, however, bifurcated in 1860 and constituted into two separate

* Dr. K. V. Ramesh, *op.cit.*, p. 261.

districts as South Kanara and North Kanara. In 1862, North Kanara (excluding the Coondapur taluk which was joined to South Kanara) was transferred to the Bombay Presidency, while South Kanara was retained in the Madras Presidency itself, and it remained so upto its integration (excluding the Kasaragod taluk) with the new Mysore State on 1st November 1956 as a result of the re-organisation of States. The Kasaragod taluk was joined to Kerala.

In 1895, the area of South Kanara district was 3,902 sq. miles and it included also a small group of islands in the Indian Ocean known as the Amindivi Islands. In 1896, there were only five taluks in South Kanara district, namely, Mangalore, Coondapur, Udipi, Kasaragod and Uppinangady. A new taluk, with Moodabidri as the headquarters and called after that place, was formed in 1910. However, for administrative reasons, the Moodabidri taluk was abolished two years later and a new taluk called the Karkal taluk was formed with effect from 1st July 1912. In 1927, the taluk of Uppinangady was renamed as Puttur and its headquarters was also located there. For purposes of revenue administration, the district was divided into three charges or divisions, namely, Coondapur, Mangalore and Puttur. The Coondapur division comprised the three northern taluks of Coondapur, Udipi and Karkal and was headed by an Indian Civil Service Officer designated as Head Assistant Collector, while the Puttur taluk comprising the taluks of Puttur and Kasaragod was under the charge of a Deputy Collector. The Mangalore taluk which constituted a division by itself, was under the charge of the headquarters Deputy Collector.

Administrative
divisions

In 1954, another new taluk, namely, Belthangady, was constituted for administrative convenience. But, on 1st November 1956, the taluk of Kasaragod, which was all along an integral part of the South Kanara district, was transferred to Kerala State as a result of the re-organisation of States. The jurisdiction of the revenue divisions of the district was again revised in 1959 and the old Mangalore division, which had been abolished earlier, and the Buntwal taluk, which was at one time an independent taluk and had been merged with Mangalore in 1858, were revived with effect from 1st October 1959. Again, in April 1966, another new taluk, namely, Sullia, was carved out of Puttur taluk, which had been considered unwieldy for purposes of revenue administration. Thus, the district of South Kanara has now (1972) eight taluks and three revenue sub-divisions as follows :—

<i>Taluk</i>		<i>Sub-Division</i>
1. Coondapur	..	1. Coondapur
2. Udipi	..	
3. Karkal	..	

<i>Taluk</i>	<i>Sub-Division</i>
4. Puttur	2. Puttur
5. Sullia	
6. Belthangady	
7. Mangalore	3. Mangalore
8. Buntwal	

These eight taluks have been further sub-divided into revenue circles or hoblies (these were called firkas in this region). During 1973, there were in all 26 hoblies which had 687 villages as follows :—

<i>Sl. No.</i>	<i>Name of taluk</i>	<i>Name of hobli</i>	<i>No. of villages</i>
1.	Coondapur	1. Coondapur	101
		2. Baindoor	
		3. Wandse	
2.	Udipi	1. Udipi	115
		2. Kaup	
		3. Kota	
		4. Brahmavara	
3.	Karkal	1. Karkal	79
		2. Moodabidri	
		3. Ajekar	
4.	Puttur	1. Puttur	68
		2. Uppinangady	
		3. Kadaba	
5.	Sullia	1. Sullia	41
		2. Panja	
6.	Belthangady	1. Belthangady	81
		2. Venoor	
		3. Kokkada	
7.	Mangalore	1. Mangalore-A	118
		2. Mangalore-B	
		3. Gurpur	
		4. Surathkal	
		5. Mulki	
8.	Buntwal	1. Buntwal	84
		2. Panemangalore	
		3. Vittal	
Total			687

Source : The Deputy Commissioner, South Kanara District.

The figures pertaining to the area (as computed by the Surveyor-General of India and cleared by the Central Statistical Organisation) and population of each taluk (as per the 1971 census) are as follows :—

Sl. No.	Name of taluk	Area in		Population as per 1971 census
		Sq. miles	Sq. kilometres	
1.	Coondapur	603.63	1,563.39	2,42,810
2.	Udipi	363.37	941.12	3,84,909
3.	Karkal	540.79	1,400.63	2,12,496
4.	Puttur	396.65	1,032.88	1,56,266
5.	Sullia	321.30	826.26	87,946
6.	Belthangady	522.62	1,353.58	1,37,535
7.	Mangalore	217.58	563.53	4,90,566
8.	Buntwal	291.35	754.59	2,26,787
	Total	3,257.29	8,436.32	19,39,315

There have been some changes in the territorial jurisdiction of some of the taluks and hoblies (firkas) in the district in recent years. Apart from the transfer of Kasaragod taluk to the Kerala State in 1956, the Amindivi Islands, which formed a part of the district, were also transferred to the newly formed Union Territory of Laccadive, Minicoy and Amindivi Islands. Within the district itself, consequent on the formation of the Belthangady taluk in 1954, 25 villages each of Belthangady and Kokkada hoblies and two villages (Barya and Tekkar) of Uppinangady hobli from the then Puttur taluk, and 29 villages of Venoor hobli from Karkal taluk were transferred to form the new taluk. Similarly, when the new taluk of Buntwal was formed in 1959, 31 villages of Buntwal hobli and 30 villages of Panemangalore hobli of the then Mangalore taluk and 24 villages of Vittal hobli from the Puttur taluk were transferred to form this new taluk. Further, for purposes of administrative convenience, the village Halady was transferred from Udipi taluk to Coondapur taluk so also the village Hejmady from Mangalore taluk to Udipi taluk and the villages of Inne, Mulladka and Mundkur from Mangalore taluk to the Karkal taluk, during that year.

Territorial
changes

Again, during 1966, consequent on the formation of the new taluk of Sullia, 19 villages of the Panja Hobli and 22 villages of Sullia hobli from the then Puttur taluk were transferred to form the new taluk. Recently (1972), a new village called Katipalla has been formed in Mangalore taluk by transferring some portions of Surathkal, Iddya and Kuthethur villages of Surathkal hobli.

People affected by the Panambur Harbour Project have been rehabilitated in this new village.

**Natural
Divisions**

The district can be divided into six natural divisions. The portion lying between the Kumaradhara to the south-east and Netravati to the north-east comprises the first. The second is the region between the Netravati and Gurpur rivers. The third division would be roughly to the south of Netravati and Kumaradhara. The fourth division consists of the land to the north of Gurpur river upto the Sitanadi; the fifth lies between the Sitanadi and the Chakranadi rivers. The portion lying beyond the Chakranadi up to the border of the district may be taken as the sixth division.

The eastern boundary of the district is either the watershed or the scarp-edge of the Western Ghats, of which the peaks vary from 910 to 1,830 metres in height while the general height of the range varies from 610 metres to the north to about 915 metres to the south.

The coast-line of South Kanara commences a few miles south of Bhatkal, which is situated in the North Kanara district. This line is indented by numerous bays and creeks, which have been formed by the river estuaries. The coast-line is low and sandy with broken and rugged rocks cropping up in places, but the area near the seaboard is well planted with coconut trees. The district possesses picturesque beauties of hill and dale, mountain and plain, wood and water, with some of the most happy combinations of all these aspects. On one side, one can see all the charms of a rural landscape while on the other, the view ranges over the unbounded ocean. The district forms a broken low plateau spreading from the foot of the Western Ghats to the Arabian Sea and forms a narrow strip with rapidly flowing rivers. It is about 177 kilometres in length, while its width varies from 40 to 80 kilometres. The altitude ranges from 60 to 120 metres near the coast and rises to about 180 metres near the foot of the ghats. The most densely inhabited part is the tract situated along the seaboard. The district is intersected by rivers and numerous valleys of the rich alluvial soil.

Mountains

As already stated, the boundary of the district towards the east is on the scarp-edge of the Western Ghats, of which the peaks vary from 910 to 1,830 metres in height. In the northern part, the range assumes the form of steep cliffs, but in the south where the range is farther from the sea, it has the character of parallel ridges intersected by deep valleys from which most of the important rivers of the district take their rise. At the extreme south, the range again approaches the sea, but in an irregular manner. From the Western Ghats, spurs run downwards in all directions—one of the longest being the Chibbidri ridge which runs from Ballalaraya Durga to Dharmasthala. Another spur from

the Kudremukh range is terminated by a towering rock on which once stood the fort of Jamalabad, and another large double-peaked rock near Moodabidri. All over the district, there are detached low hills which become less and less frequent as the coast is approached.

These mountain ranges present to their west a surface almost perpendicular to the horizon, and by their height intercept the clouds of the south-west monsoon. The extraordinary moisture is not only favourable to the growth of the peculiar products of this district, but also covers the face of the country with timber of luxuriant stature. The onset of the south-west monsoon is the time to see these mountains at their grandest. Black clouds form themselves into giant wheels in the sky and throw out streamers and drop long grey curtains of rain. As the sky appears "blotted out," the rumble of the thunder grows louder and the lances of lightning seems to dart into the bowels of the earth. Nature's awesome splendour has revealed itself and the district settles down to a long period of incessant rains.

The most interesting of the mountains of South Kanara is the Kudremukh group of three peaks on the highest ridge of the Western Ghats facing Belthangady. They are: the peak known as the Mukha Head, which is 1,881 metres (6,173 feet) from the sea-level, with a magnificent precipice of over 300 metres, the Midge Point, 1,883 metres (6,177 feet) and the Funk Hill, 1,892 metres (6,207 feet), a little higher up. Important among the other peaks are Kodachadri, about 27 kms. from Coondapur, which is 1,341 metres (4,400 feet) high, Ballalaraya Durga over Bangadi valley, 1,504 metres (4,934 feet) high, Kattagudda to the south of Charmadi Ghat road, 1,382 metres (4,534 feet) high, Subramanya, 1,727 metres (5,667 feet) high, overlooking the Bisle Ghat, and Sisalkal, 1,195 metres (3,921 feet), over the old Sisala Ghat. Amongst the isolated hills, Ammedikal rises to a height of 1,293 metres (4,261 feet) from the low area a little distance off the ghats in the Puttur taluk. **Kudremukh**

The Western Ghats being the eastern boundary of the district for almost its whole length, communication with the rest of the State has to be through passes on this mountain range. Beginning from the south of the district to the north, it is found that the first ghat road from Madras to Mangalore through Bangalore and Mercara goes through the Sampaje Pass entering the district in the southern corner of Puttur taluk. Then, the road from Hassan and Sakleshpur comes down the Shiradi Ghat and runs west to Mangalore joined by the Bisle Ghat road at Uppinangady. The third is a road from Chikmagalur coming down the Charmadi or Kodekal Pass and running west to Mangalore. The fourth road from Agumbe branches itself at Someshwar in Karkal taluk, one

branch running across that taluk upto Mangalore and the other going upto Coondapur. Two roads from Shimoga district pass through the Hydergarh Ghat and Kollur Pass in Coondapur taluk.

Rivers

On account of the situation of these ghats on the eastern part of the district, the rivers of South Kanara necessarily flow from east to west. None of them takes its rise as much as about 35 kilometres beyond the peaks of the Western Ghats and since these ghats are nowhere more than 80 kilometres from the sea, the course of each of these rivers nowhere exceeds 150 or 160 kilometres. The rainfall of the south-west monsoon, which is very heavy, and the broken nature of the area are responsible for the rise of a number of rivers and streams and also the great volume of water in them at monsoon times. During the monsoon, the current in these rivers is rapid rendering them unfavourable as a means of communication. In the dry weather, the rocky character of the river beds is exposed and they are not usually navigable for any length above the reach of tidal influence. Within these limits, however, they are being used for bringing produce to the coastal ports and towns. Traffic is also facilitated by the backwaters which are formed by sand spits thrown up by the meeting of the river and the littoral currents, and often run for several kilometres along the coast before the waters of the rivers find their way into the sea.

During the monsoon, all the rivers and streams become swollen due to heavy rains and some of them overflow their banks, inundating the surrounding areas. But they do not last long for they retrieve to their normal positions within a short period. Sometimes, unusually heavy rains and flooding of rivers occasionally cause damages to the crops (see Chapter IV). But they also deposit fertilising silt which is beneficial for the crops. There is an abundance of fish in most of the rivers of the district.

Among the principal rivers of the district may be mentioned the Netravati, Gurpur, Gangolli, Sitanadi and Swarnanadi. Some of these rivers have been mentioned in the Markandeya, Vayu and Bhavishyottara Puranas*.

Netravati

The Netravati rises in the ghats to the east of Kudremukh and flows down the Bangadi valley past Belthangady, after which it is joined at Uppinangady by another river called the Kumardhara, which comes from Kumara-Parvata near Subramanya. The combined stream passes over a rocky bed with many rapids to Buntwal and through richly wooded banks to Mangalore. From Buntwal the river is navigable to boats upto a capacity of about three tons. As it approaches Mangalore, the channel assumes wider

* "Ancient Karnataka" by Dr. B. A. Saletore, Vol. I, pp. 38-47.

proportions and is studded by a number of small islands called "kudrus," rising a few feet above the surface of the water. These small islets are exceedingly fertile and rice and sugarcane cultivation is extensively carried on in them. At Mangalore, the Netravati joins the Gurpur river flowing to the north of it and both discharge their combined waters into a backwater forming a common estuary to the two rivers, having a long spit of sand intervening between it and the sea.

The three rivers Tunga, Bhadra and Netravati take their rise practically at the same place in the Western Ghats. The first two flow eastwards and the Netravati flows westwards. A legend says that the giant Hiranyaksha carried the earth to *Patala*. The "gods became afraid" and approached Vishnu. The latter took the form of a boar and killed the giant. When he was sitting on the Veda-pada Parvata, the right tusk of the boar broke and there flowed the Bhadra; from the left tusk gushed out the Tunga; the water which flowed through the eyes (Netra) became the Netravati*.

The river Gangolli is formed by several smaller streams that meet and form a broad estuary to the north of Coondapur town, and fall into the sea at Gangolli. Of the important streams forming it may be mentioned the Kollur, Haladi and Chakranadi streams. As the Western Ghats are nowhere more than 40 kilometres (25 miles) from the sea in Coondapur taluk, the course of these rivers is very short, but the quantity of water brought down is very large owing to the heavy rains. **Gangolli**

The Haladi stream takes its rise in the ghats near Amashabail, about 10 kilometres to the north of Udipi taluk, while the Kollur stream has also its source in the ghats forming the north-western boundary of Coondapur taluk, a few kilometres beyond Dali. It skirts the coast for about 15 kilometres north of Coondapur. The Chakranadi joins the Kollur stream about five kilometres from Coondapur. These streams are of some importance from the point of view of navigability also.

The Sitanadi takes its rise in the ghats beyond Someshwar to the north-east of the Udipi taluk, while the Swarnanadi flows from the hills situated at the south-eastern boundary of the same taluk. Both join the sea at Barakur, about 13 kilometres to the north of the town of Udipi, a large backwater being formed by their junction. The Sitanadi is navigable as far as about 18 kilometres in length and the Swarnanadi upto about 19 kilometres from the coast, Shirur, Uppunda, Kallianpur, Udyavara, Malukal, Mulki, Pavanje, Varahi, Dasanakatte-Hole, Neriya-Hole, **Sitanadi and Swarnanadi**

* "Indian Antiquary", Vol. I, pp. 212-213.

Shishila-Hole, Gowri-Hole, etc., are among the other minor rivers and streams flowing in the district.

Estuaries

Among the important estuaries may be mentioned the one at the junction of Netravati and Gurpur rivers, having a long spit of sand between it and the sea. The second one is at Gangolli where the Haladi stream forms a large and picturesque estuary, which is really an extensive salt-water lake with only one outlet to the sea. The third estuary is the large backwater at Hangarkatta where the Sitanadi and the Swarnanadi join the sea.

Geology

In the District Manual published in 1894, information on the general geology of the area as a part of the peninsular India had been given. Recent surveys, however, have revealed certain characteristics which warrant a revision of the earlier account.

Excepting for the coastal region, where there are formations to be classed as recent and sub-recent deposits and the lateritic formations, the rock formations in the rest of the area belong to the earliest period of the earth's history—the Archaean epoch. The main rock types occurring in the district are arranged in the following sequence :—

Recent and Sub-Recent.—Alluvial formations, clays, red and dark clay soils and laterite-like or lateroid formations.

Intrusives.—Dolerite, basic and ultra-basic rocks, charnockites and granitic gneisses.

Dharwars.—Older metamorphic rocks, garnetiferous quartz, sillimanite, talc-schists, hornblende schists, chlorite schists and banded haematite quartzites.

The older metamorphic rocks constitute mainly the Dharwars and they are represented by the banded ferruginous quartzites and, to a small extent, by the talc and hornblende schists. The quartzites are highly folded and form a series of ridges on the eastern side of the district. Five such bands occur. The individual layers vary in thickness. Next in importance are the talc schists occurring mostly as isolated patches in the biotite gneiss, the latest outcrop being seen to the immediate west of Belthangady. Outcrops of hornblende schists are few and far between.

The most extensive rock formation in the area is the biotite gneiss. Granites occur as minor intrusives. Except for a few variations, they have a general strike, north-west south-east to north north-west-south to south-east, their trend being parallel to the direction of the Western Ghats and dip westwards on the average at 45°. The foliation direction generally conforms with the strike. The rock consists of vitreous quartz, acid to intermediate feldspars and biotite. Accessory minerals include apatite, spirel, diopside

and pink garnet. These gneisses and granites belong to the peninsular gneiss series. There are exposures of hornblende and biotite bearing granulites close to the massifs of the Western Ghats in the Shiradi Ghat, on the road to Subramanya and also on the road from Mangalore to Mercara. Some of these are in the form of fine-grained biotite pyroxene granulites containing abundant hypersthene, biotite and granuloze quartz, and oligoclase feldspars with magnetite as accessory mineral. Some of these bear close resemblance to the charnockite rocks.

The biotite gneisses are intruded by basic and ultra-basic sills and dykes giving rise, more or less, to narrow ridges rising between thirty and sixty metres above the gneissic country. The majority of these run generally north west-south east in conformity with the trend of the major rock types. The ultra-basic rocks vary in composition from pyroxenites to amphibolites. Some of them are also porphyritic. A few runs of dolerites are found as intrusives into the older formations.

Laterite-like formations cover a fairly large area along the coast and a little to the interior. These rocks are of considerable thickness and they probably represent the alterations of the underlying rocks by processes of laterisation and the ferruginous character at the surface is characteristic of such formations. The clays and deposits of shell-limestone are of recent origin. Along the river valleys, clays of different colours are found with alluvial material.

Prior to 1960, the South Kanara district was considered poor in regard to its mineral resources. But as a result of the surveys conducted in 1960 and thereafter, the district is found to contain several useful mineral deposits. A brief account of the more important occurrences in the district is given in the following paragraphs.

Deposits of bauxite, analysing from 45 to 50 per cent Al_2O_3 , have been reported from Paduvare near Baindoor, Mudgalpare, Naganakalpare, Doddahara and Guppipare in Coondapur taluk. Of these, the deposit at Paduvare is extensive and is estimated to have a reserve of over five million tonnes.

Banded granitic gneisses are quarried at a number of places in the district. The grey banded granitic gneisses occurring near Bondal, about 12 kilometres east of Panambur harbour, are quarried extensively into blocks of one to three tonnes and used for constructional works at the Harbour Project site near Mangalore. Laterite is quarried on a large scale in Thokur and Padushedde in Mangalore taluk.

Building-stone quarries are also being worked on a lease basis at the following places in the district: Bala, Kalavar, Derebail and Kuthethur in Mangalore taluk; Aleyoor, Kilpady, Shira, Padu, Kadavoor and Harady in Udipi taluk; Kukkundur, Miyur and Karkal in Karkal taluk; and Vittal and Jadikidu in Buntwal taluk. Sand is collected extensively from the Gurpur river bed for constructional purposes.

Corundum

Corundum occurs as irregular crystals, usually admixed with quartz and kyanite, near Sampyadi, about ten kilometres from Uppinangady on Subramanya road. Corundum with quartz in mica schist occurs also in Kombar and Bogimalai hill ranges.

Garnet

Ruby garnet occurs in mica-chlorite schist near Subramanya and Gundia in Sullia taluk. The nodules of this garnet vary in size from $\frac{1}{8}$ " to 4", the colour being ruby red, pale pinkish red to deep honey yellow. Semi-precious transparent varieties of garnet are obtained along the *nala* beds, especially in Gundia-hole.

Gold

Alluvial gold is known to occur in the Mudnur-hole at Kayu in Puttur taluk.

Iron ore

Lateritic and limonitic iron ore occurrences are reported from the following localities in the district: (a) Sunkadakatte area in Puttur taluk; (b) Vittala-Kanyana hill range in Puttur taluk; (c) Keradi area in Coondapur taluk; and (d) Nidle area in Belthangady taluk. Of these, the iron ore deposits of Sunkadakatte, occurring on a ridge connecting Arabadagudda, Boryegudda, Butalgudda and Odathmukh in the Yenekal and Balapa reserve forests in Puttur taluk, are important. These ores are associated with laterite and contain 54 to 57 per cent iron. The reserves are estimated at about three million tonnes.

Kyanite

Kyanite, along with corundum, is noticed near Sampyadi, about ten kilometres from Uppinangady. The rock contains about 60 per cent kyanite, 30 per cent corundum and 10 per cent quartz.

Lime-shell

Accumulation of lime-shell is seen in the backwaters near Kaup, Tonse, Balekudru, Airody, Baikady, Harady and Coondapur. About 1,000 to 3,000 tonnes of lime-shells are removed in the district annually. There is one mining lease for lime-shell in Udipi taluk covering an area of 59.34 hectares.

Silica Sand

Pure white to greyish white silica sand is noticed along the coastal belt at Mulur, Kaup, Hejmady, Tonse and Uliargoli in Udipi taluk. The sand occurs as a thin layer, one to three feet in thickness, below fine grained brownish sand. About 12,000 tonnes of silica sand is produced annually from these areas in the

taluk and is mostly used as moulding sand in foundries, as also for the manufacture of sodium silicate.

The total reserves of silica sand in the district are estimated at 1.5 million tonnes. There are seven mineral concessions for this sand, covering an area of 123.37 hectares, under mining leases in Udipi taluk.

White to greyish white sillimanite is found in mica schist in the Bogimalai hill range, the grain-size of the sand varying from 35 to 100 mesh. Patches of this mineral are seen near Kaup, Padu, Mulur, Uliargoli, Udyavara, Nadisal and Hejmady in Udipi taluk and Mukka-Shashihithlu near Surathkal. Annually about 10 to 15 thousand tonnes of this mineral are exploited in the district, the main consuming centres being Bombay, Bangalore and Madras. There are eleven operating mining leases covering an area of 223 hectares. **Sillimanite**

Patches of altered ultramafic rocks occur near Puttur and Kadaba on Subramanya road. **Soapstone**

Tile clays of excellent quality are found in the paddy fields, beneath a covering of soil varying from one to three feet in thickness, in a number of places in the district, viz., Halnadu, Tekatte, Sowkoo, Kailkere, Amunja, Kariyangala, Kandavar, Koppala, Nantoor, Talamugyer, Jalakakatte, Palligudde, Gurpur, Panambur, Sadoor, Kannur, Marashi, Sarkal, Gudibettu, Kenjar, Adyar, Palimar, Marakada, Bijinder, Sujir, Addoor, Uppoor, Malpe, Maravoor, Kulai, Karangubail, Bajal and Innoli. There are a number of tile factories in the district which consume these clays for the manufacture of the famous Mangalore tiles. **Tile clay**

South Kanara is essentially a forest district and flora is luxuriant and complex. The slopes of the Western Ghats are clothed with dense vegetation containing valuable timber species. The heavy rainfall in this area stimulates the growth of forests which, sometimes, begin within a few kilometres of the sea coast as in Coonadpur taluk. Generally, heavy forest begins about 30 to 40 kms. from the coast. The pressure on land has, however, been steadily pushing back the forest from the coastal belt. Originally, the forests in the district were largely evergreen. But now, different stages or types of forests ranging from the evergreen to the scrub type can well be seen in this district. Cultivation being confined mainly to the plains near the coast and the bottoms of the valleys, which wind amongst the laterite hills and plateaus, jungles varying from moderate forest to scrub are to be found everywhere throughout the large area of waste land. Complete denudation of the slopes of the valleys is comparatively rare, but the system of kumari cultivation, which entailed the clearing of **Forests**

forest land by fire in the past, has resulted in large tracts of land being cleared of forest growth where mere bushes now grow and where fine timber once abounded. This type of clearance was going on for quite a long time and it was noticed even in 1801 by Buchanan. It is a well-known fact that where primitive cultivators found forests, which they could freely cut down and burn to snatch a crop or two from the clearing before abandoning it to repeat the process elsewhere, shifting cultivation greatly changed the character of forest vegetation and the district of South Kanara has been no exception to this. It was not till about 1860 that this matter was seriously taken on hand and orders were issued directing its discontinuance. Subsequently, these strict rules were relaxed to a little extent in order to meet the needs of certain forest tribes who had no other means of livelihood. This prohibition, however, was not enforced very strictly. In 1898, it was found necessary to take more stringent action and limited areas were given to the hill tribes for their shifting cultivation and they were encouraged to plant teak. As a result of such planting, there arose some scattered patches of teak among the re-growth on old *kumari* lands. In 1874, before the passing of the Forest Act, the Government of Madras directed the removal of all existing restrictions from the exercise of proprietary rights in jungles which were private property and the demarcation of valuable forest land which was admittedly Government property. It was clear, however, that only a small area of the forest land in South Kanara had any legal claim to be considered private forest, while a large extent was Government property, subject only to rights of way and water and rights to pasture and forest produce. The South Kanara raiyat may be said to be still in a fortunate position, as compared with others, in respect of his forest needs. Since almost all waste land is covered with some sort of forest, he can, apart from having grazing for his cattle, cut timber for his fuel (other than reserved trees) and collect green leaf for manuring his cultivated land. The period following the first world war was marked by special planting activity and thousands of acres were planted with *kiralbhogi* (*Hopea parviflora*).

Flora

As already stated, the forests in the district were originally largely evergreen, but now-a-days they are both evergreen and deciduous. Many of the trees, notably the poonspar (*Calophyllum elatum*) and the *kiralbhogi* attain an immense size, especially on the slopes of the ghats. Teak is abundant in the Puttur taluk, though it is found in varying degrees all over the district. Blackwood is common in Coondapur and Puttur taluks. Sandalwood is found distributed over the plains, usually nearer to the sea. Thus, at present, practically all types of forests can be met with—evergreen in the ghat belt, semi-evergreen in the foot hills, deciduous in the outer ridges and in the areas bearing secondary growth and scrub type in the exposed lateritic flat topped table land. Principal

among the species in the scrub type of jungle are *Strychnos nux-vomica*, *Eugenia jambolana*, *Phyllanthus emblica* and the cashew-nut. In the dry deciduous areas bamboo is of common occurrence. The principal timbers in this area are *matti*, *maravu*, benteak, jack and the wild jack. In the moist deciduous type covering the protected valleys and some of the localities which have escaped the ravages of man, the principal species are myrol, jack, ebony, ironwood, etc. It is difficult to demarcate areas where the semi-evergreen type dominates, because this type of forest is more or less a transitory phase between the deciduous and the evergreen type. The major portion of this type of forest is, however, found on the slopes of the ghats next to the evergreen zone. Climbers, reeds and cane brakes are found in abundance in this type of forest. The principal species of timber in the evergreen forests are *matti*, myrobalan, *maravu*, benteak, *kiralbhogi* and a variety of other valuable timber.

The aloe (*katale*) is not so common in this district as on the east coast and it is grown in some places as hedges. The pine-apple was perhaps introduced into the district by the Portuguese and now it grows in considerable quantity all over the district. Ginger is commonly grown in the *hakkal* cultivation areas. A species of wild ginger is found in the forests at the foot of the hills. Turmeric is chiefly found in the Karkal taluk but is grown in small patches all over the district. Cardamom is found over the ghat forests but the chief plantation is at Neria near Belthangady. The plantain is cultivated extensively throughout the district and very tasty varieties are to be found in and around Mangalore. The wild plantain is valued chiefly for its fibre. The fragrant screw pine (*kedige*) is found all along the streams and backwaters; its flower is much valued as a head decoration for women and in the old days umbrellas were fashioned from its leaves. The rattan cane (*betta*) is found commonly in the forests. A variety of cane that is covered with black spots is called *nagabetta* and is prized as making very good walking sticks. Pepper is native to the South Kanara forest and is an important cash crop. The cultivation of betel leaf is common throughout the district. The country fig (*atti*), the sacred fig (*ashwattha*) and the banyan (*ala*) are found all over the district. The forest areas abound in a variety of creepers and climbers, the leaves and roots of some of which are highly valued as possessing medicinal properties and are mentioned in the Indian Pharmacopoeia. The *nux-vomica* tree is very common and the seed is valued both in indigenous and foreign medical practice and strychnine is produced from the kernel of the fruit. The swallow wort (*ekkamale*) is found in dry places and the dried bark of the root is both a diaphoretic and an emetic. The datura (*ummatti*) is common and its medicinal and poisonous qualities are equally well-known. The plants belonging to the hibiscus group are grown commonly and are

valued either as vegetables or for their fibre. A tall and straight evergreen tree found in the forest is poonspar (*shrihonne*) and is much used for masts and spars of sailing vessels. The citrus varieties are chiefly grown for their fruit. The ferns of South Kanara are many and are to be seen, during the rainy season, on almost every exposed wall in the district and on bushes fringing streams and tanks. The local names of the various plant species commonly found in the forests of South Kanara are given below with their scientific (Latin) names :—

<i>Local name</i>	<i>Scientific (Latin) name</i>
Ardhala }	Garcinia morella
	Garcinia cambogia
Ashoka	Saraca indica
Ashoka	Polyalthia longifolia
Adake (Kadu)	Pinanga dicksonii
Anavu }	Adina cordifolia
Arasinathega	
Anjana	Hardwickia binata
Athi	Ficus glomerata
Amdate	Spondias mangifera
Ambate (Kadu)	Spondias acuminata
Aundipunar	Carallia integrifolia
Antala, Antvala	Sapindus trifoliatus
Arkeburu	Pothos scandens
Analekai, alalekai	Terminalia chebula
Angare	Laportea termalis
Angaru (Male)	Laportea crenulata
Adumba Balli	Ipomea biloba
Arali, Aswatha	Ficus religiosa
Anenaru (Kaithali)	Sterculia villosa
Adosage (Adusoge)	Adhatoda vasica
Anechagate	Cassia occidentalis
Ane-munju	Oreoxylon indicum
Advainimbe }	Atlantia monophylla
Okkikolu (CJ)	
Kadu kanchihuli	
Aladantara	Ficus bengalensis
Alimara, nemara	Memecylon edule
Amme (CJ)	Canthium didymum
Amemunde, buthale (Cg)	Agave americana
Arjuna neelamathi	Terminalia arjuna
Aath, nagasampige	Mesua ferrea
Egin	Cinnamomum zeylanicum
Irippu, Ippe	Madhuka longifolia
Echalumara	Phoenix sylvestris
Eachalugida }	Phoenix acaulis
Udariberu	
Halavumakkalathayiberu	Asparagus racemosus

<i>Local name</i>	<i>Scientific (Latin) name</i>
Uruhathimara	Eriodendron anfractuosum
Ummatha, umbe	Datura fastuosa
Undehuli, otehuli	Artocarpus lakoocha
Ekka	Calotropis gigantea
Engiru	Calycopteris floribunda
Elakkia	Elettaria cardamomum
Elude (Cg) Renge	Mimusops elengi
Ollemenasu	Piper nigrum
Ote	Ochlandra sheedi
Kakke, Konde	Cassia fistula
Kadadu, Kadambolu	Mitragyna parviflora
Kalbhogi, Haigh, Karmara	Hopeawightiana
Karimara	Diospyrous ebenum
Kalanjikai	Caesalpinia bonducella
Gajjiga	
Kanpiti	Sapium insigne
Kamakahthannu	Averrhoa carambola
Dhearchuli	
Kanje	Myristica malabarica
Kasarka	Strychnos nux-vomica
Kayru balli	Strychnos aenea
Kavatte	Zanthoxylum rhetsa
Karegida	Canthium parviflorum
Karemara	Randia dumetorum
Kadumunde	Pandanus species
Gubbikedage	
Kalli	Euphorbia antiquorum
Kachi, Katuharalu	Jatropha curcas
Karadi (Dal-mara)	Chukrassia tabularis
Karpuradamara	Cinnamomum campech
Kaduhogesoppu	Lobelia nicotianaefolia
Kanda	
Karundote	Sida rhombifolia
Kachu	Acacia catechu
Kiralbhogi	Hopea Parviflora
Kulurmavu	Machilus macrantha
Kumbale	Gmelina arborea
Kumkama	Mallotus phillippensis
Kenge, Giddarengge	Elaeocarpus tuberculatus
Kodukalli	Euphorbia tirucalli
Kokkekai	Tabernae montana dichotoma
Kapula	Ixora coccinea
Kendage (Kedige)	Pandanus odoratissimus
Kembu (Keshavu)	Maranta arundinacea
Korkil	Strobilanthes barbatus
Kodenchi	Holarrhena antidysenterica
Konkanike	Indigofera wightii
Kotte nullu	Zizyphus rugosa
Papasukalli	Opuntia dillenii
Garikehullu	Cynodon dactylon
Gantha (Gandha)	Santalum album

<i>Local name</i>	<i>Scientific (Latin) name</i>
Garugathi	<i>Ficus asperima</i>
Galimaddu (Cg)	<i>Artemisia vulgaris</i>
Gulaganji	<i>Abrus precatorius</i>
Geruhannu	<i>Anacardium occidentale</i>
Geru, Chere	<i>Holigarna arnottiana</i>
Goratehuvu	<i>Barleria prionites</i>
Goddanara, punil	<i>Odina wodier</i>
Galimara	<i>Casuarina equisetifolia</i>
Gangagile (Kempu)	<i>Nerium odorum</i>
Chagate	<i>Cassia tora</i>
Chandentullia	<i>Acacia intsia</i>
Chakkatte	<i>Schleichera oleosa</i>
Chhemullu	<i>Caesalpinia mimosoides</i>
Chunde	<i>Solanum torvum</i>
Churimullu	<i>Zizyphus oenoplia</i>
Chakkota	<i>Citrus decumana</i>
Challangai	<i>Cordia myxa</i>
Jambunerale	<i>Eugenia jambos</i>
Jarigehuli	<i>Garcinia morella</i>
Thani, Thandi, Shanthi	<i>Terminalia belerica</i>
Thumba	<i>Leucas cephaotes</i>
Thiruva	<i>Xylia xylocarpa</i>
Thengu	<i>Cocos nucifera</i>
Thulsi	<i>Ocimum sanctum</i>
Thangadi	<i>Cassia auriculata</i>
Daddala	<i>Careya arborea</i>
Dadassu	<i>Grewia tiliaefolia</i>
Devaganegile	} <i>Plumeria acutifolia</i>
Devakalli	
Dhupa (Bilkki)	<i>Vateria indica</i>
Dhupa (Guggalu)	<i>Ailanthus malabarica</i>
Dhupa (Mande)	<i>Canarium strictum</i>
Dhooma	<i>Dipterocarpus iudicus</i>
Deogugge	} <i>Artocarpus chapalasha</i>
Divihalasu	
Nandi, Benteak	<i>Lagerstroemia lanceolata</i>
Nannari, Sugandhi	} <i>Hemidesmus indicus</i>
Haluberu	
Narugida	<i>Helicteres isora</i>
Nayinerale	<i>Eugenia caryophyllifolia</i>
Nachikemullu	} <i>Mimosa pudica</i>
Muttidaremuni	
Nayibetha	<i>Calamus travancoricus</i>
Nagabetha	<i>Calamus rotang</i>
Nayikuli	<i>Wrightia tinctoria</i>
Nanil	<i>Eugenia heyneana</i>
Narande	<i>Vitis indica</i>
Neccranti	<i>Lagerstroemia flos-reginae</i>
Neelagiri mara	<i>Eucalyptus species</i>
Nellikayi	<i>Embllica officinalis</i>
Nedilu	<i>Lecasambu cina</i>

<i>Local names</i>	<i>Scientific (Latin) names</i>
Nethibayi }	<i>Arenga saccharifera</i>
Katuthengu }	<i>Melastoma malabathricum</i>
Nekkare	<i>Eugenia jamboolana</i>
Nerale	<i>Vitex negundo</i>
Nekki (Nukki)	<i>Gnetumscandens</i>
Norukatte	<i>Alstonia scholaris</i>
Pale	<i>Trema orientalis</i>
Pajevu	<i>Glycosmis pentaphylla</i>
Pandil, somara	<i>Garcinia indica</i>
Punarpuli	<i>Stereosporium chelonoides</i>
Pudike, katuncerulli	
Pindikai }	<i>Myristica malabarica</i>
Ramapatri }	<i>Spathodea campanulata</i>
Tiehkai	<i>Bryophyllum pinnatum</i>
Pottutte (Cg)	<i>Pocillonuron indicum</i>
Balgi	<i>Acacia farruginea</i>
Banni	<i>Musa paradisiaca</i>
Balehannu	<i>Musa superba</i>
Bale (Kallu)	<i>Trewia nudiflora</i>
Balemara	<i>Tetrameles andiflora</i>
Bendemara	<i>Terminalia catappa</i>
Badami	<i>Caryota urens</i>
Bayane (Bageni)	<i>Albizzia lebbek</i>
Bage	<i>Albizzia procera</i>
Bage (Kallu)	<i>Bauhinia racemosa</i>
Basavanapada (Rabeeja)	<i>Feronia elephantum</i>
Bela	<i>Mussaenda frondosa</i>
Belisoppu	<i>Azadirachta indica</i>
Bevu	<i>Olea dioica</i>
Bilisarali	<i>Aegle marmelos</i>
Bilipathre	<i>Dalbergia latifolia</i>
Beeti	<i>Salmalia malabaricum</i>
Boorga	
Pallikai }	<i>Entada scandens</i>
Chilki }	
Benge, Honne	<i>Pertocarpus marsupium</i>
Sairi, Bassari	<i>Antiaris toxicaria</i>
Baimbuli	<i>Averrhoa bilimbi</i>
Bothuballi (Cg)	<i>Streptocaulon kleinii</i>
Bolpale	<i>Lophopetalum wightianum</i>
Bidiru	<i>Bambusa arundinaceae</i>
Suguri	<i>Thespesia populnea</i>
Bevu (Kari)	<i>Murrya Koenigii</i>
Bevu (kadu)	<i>Murraya exotica</i>
Majakkari }	<i>Limonia acidissima</i>
Gajanimbe }	<i>Webera monosperma</i>
Madambode	<i>Terminalia paniculata</i>
Maruva	<i>Andropogon species</i>
Majjigesoppu	<i>Hippocratea arnoptiona</i>
Maderi balli	<i>Mangifera indica</i>
Mavinamara	<i>Amarantus spinosus</i>
Mullukire	

<i>Local names</i>	<i>Scientific (Latin) name</i>
Muchiru	Dillenia pentagyna
Myrolu, Menja	Vitex altissima
Navilupada	
Muthuga, Ethiga	Butea frondosa
Muthugada balli	Butea superba
Maragenasu	Manihot utilisissima
Rubber	Heavia brasiliensis
Rampala	Annona reticulata
Lolisara	Aloe vera
Lenkiri	Oxytenanthara monostigma
	Oxytenanthara stockeii
Saroli	Aporosa lindleyana
Sattuga (Hennu)	Evodia lunuankenda
Sattuga (Gandu)	Evodia meliaefolia
Saguvani	Tectona grandis
Sampige	Michelia champaca
Shreehonne	Calophyllum tomentosum
Sapota	Achras sapota
Seebekai, Peralekai	Psidium guajava
Surante	Hydnocarpus whightiana
Shige	Acacia concinna
Sarpagandhi	Rawolfia serpentina
Seethaphala	Annona squamosa
Seemehunase	Pithecellobium dulce
Shunti	Zingiber officinale
Halasu	Artocarpus integrifolia
Hathi	Gossypium arboreum
Halubetta	Calamus pseudotenuis
Hunasemara	Tamarindus indica
Hebbalasu	Artocarpus hirsuta
Hongaraka	Erythrina indica
Hongemara	Pongamia glabra

The problem of soil erosion has been assuming serious proportions in recent years. In a district with an average rainfall of over 150 inches, with a sufficiently large population asserting its rights over nature's protective clothing, this is no great surprise. The low detached hills are hacked year after year and burnt annually for the sake of 'muli' grass. The burning wounds the soil though it facilitates an initial growth of this grass. But in the long run this is destructive as there is no padding against the impact of the first heavy monsoon showers. The result obviously is seen in the extensive gullies disfiguring the slopes and in the exposed lateritic surface.

The area of reserved forest in this district is now mostly confined to the western slopes and covers an area of about 2,000 sq. kilometres. The *kiralbhogi*, which is the best building timber of the district, was distributed in dense patches over the unreserved

forest covering an area of 2,823 sq. kilometres. Unscrupulous timber traders smuggled most of this valuable timber so that to-day many of these are mere barren waste lands. Steps have now, however, been taken to reserve the still remaining wooded areas. The total area under forests in the district in 1971 was about 2,460 sq. kilometres (or 2,46,000 hectares), the percentage of forest area to the total area of the district being about 29 per cent. The chief hard timbers of economic importance in this district are rosewood, teak, benteak, *vengai*, *kiralbhogi*, *banapu* or *matti*, *maravu* and the wild jack. *Casuarina*, which is grown along the coast and in the interior in patches, and cashew-nut, which is distributed all over the district in the open areas, are two species not indigenous to this district, but now of great commercial importance, especially the latter. Among the chief items of minor forest produce are cardamom, cinnamon leaves and bark, canes, bamboo, wood oil, myrobalans, catechu, *matti* bark, soapnut and nutmeg.

The large extent of forest lands in this district affords a safe home to wild animals of the type generally found in South India. The bison (*Gavaeus gaurus*) is to be found along the line of the ghats from north to south. Next to the bison, comes the sambar (*Rusa aristotelis*) which is to be found in large numbers in the grassy areas on the slopes of the ghats. In the more open jungle to the west there can be seen herds of spotted deer (*Axis maculatus*) and occasionally jungle sheep or barking deer (*Cervulus aureus*). The little mouse deer (*Memimna indica*) is also found, but is not very common. According to the District Manual of South Kanara (1894) compiled by Mr. John Sturrock, elephants were met with in the interior hill tracts of the district damaging the forests and to some extent agricultural crops and tigers (*Felis tigris*) and cheetas or leopards (*Felis pardus*) were found to inhabit the densely wooded areas and cause damage to cattle in the villages situated in these areas. But according to the District Forest Authorities, these denizens of the forest have now almost become extinct and only occasionally elephants from the forests of the neighbouring *malnad* districts migrate to the district only temporarily. The wild dog (*Guon rutilans*) is not very common. Monkeys are a source of nuisance to the villagers, destroying crops and considerable damage is being caused in certain localities to young cashew and bombax plantations by these monkeys. Wild boars are also responsible for damage to agricultural crops. Porcupines, rabbits, foxes and squirrels are found distributed all over. The mongoose is a very familiar sight. The scaly antcater is not infrequent. Otters are to be found in most of the large rivers.

Crocodiles, the largest of the reptiles, are to be found in the larger rivers, but the crocodile in this district does not attain the same size as in Malabar, nor is it so destructive. The ordinary

Fauna

Reptiles

snakes of South Kanara are much the same as in other parts of South India, but the Indian python is more common here than in other districts and sometimes attains to enormous size in the ghat forests where can be found also a bamboo-coloured variety of cobra. The common cobra is to be found all over. The harmless green whip snake is common. Amongst the minor reptiles, a peculiar species occasionally to be met with is the flying lizard.

Insects

South Kanara abounds in insects, especially the knife-grinder (*cicada*), whose whirring noise is always heard in the forests. Butterflies and moths are found in great variety. The number of leaf insects and the stick insects is also considerable. The only economically valuable insect is the bee which builds its nest on the higher branches of the lofty trees or in the clefts or rocks which render the honey-combs difficult of access. But the small type of this species, however, builds in the hollows of the trunks of the old trees and the honey collected by it is much prized.

Birds

The birds of the district do not differ materially from those found elsewhere in the contiguous areas. Pea fowl, jungle fowl and spur fowl abound in the forests. Partridges are not very common. There are several kinds of pigeons. Snipes come in good number in the cold weather. Plovers of different kinds are found in flocks near the coast and on the backwaters. The indiscriminate snaring and trapping of birds has been, to a certain extent, responsible for the reduction in their number and, lately, action has been taken to prohibit this type of destruction.

Domestic animals

Domestic animals reared in this district are not generally good specimens of their class. The cattle in general are of a small stunted breed and attain no great size or working powers. The humid or damp climate of the district is not, perhaps, conducive to the health of these animals. The period from January to the onset of the monsoon is marked by scanty pasture and it is usual to feed the cattle with stored fodder. During the rainy season, pasture is abundant and domestic cattle are left to graze on the hills and plains. The country cows do not yield much milk and, therefore, there is greater dependence on she-buffaloes which give a larger quantity. There is no large population of sheep, horses or donkeys. Pigs of the common country breed are reared by some. Fowls are kept by a large number of households. Particular attention is even now paid to the rearing of game cocks, since cock-fighting is a favourite pastime of the people in the rural parts (*see* also Chapters III and IV).

There are no game preserves or sanctuaries in the district. Since the fauna is fast disappearing, appeals are being made to the public not to kill the game indiscriminately. The Mysore Forest Act and Rules are in force in the district. Shooting of animals

in the State forests is strictly prohibited. However, licences are issued for shooting game or dangerous animals in special circumstances, in accordance with the provisions of the Shooting and Game Rules framed by the State Government.

The climate of this district is marked by heavy rainfall, high humidities and oppressive weather in the hot season. The year may be divided into four seasons. The hot season from March to May is followed by the south-west monsoon season from June to September. October and November constitute the retreating monsoon or post-monsoon season. December to February may be called the north-east monsoon season although the rains associated with the north-east monsoon cease after December and the rest of the season is generally dry. Climate

The district has a good network of rain gauge stations, records of which extend to periods ranging from 60 to 90 years. A statement of the rainfall at these stations and for the district as a whole are given in Tables 1 and 2, while the taluk-wise actual rainfall from 1951 to 1972 is given in Table 3. The main rainy season is from June to September. The average annual rainfall in the district is 3,930 mm. (154.73"). The rainfall increases from the coast towards the Western Ghats on the eastern border of the district. In the coastal strip in the northernmost part of the district in the Bhatkal-Baindoor region, the rainfall is heavier than in the southern coastal strip. About 87 per cent of the annual rainfall is received during the south-west monsoon season, July being the month with the heaviest rainfall. Some rainfall is received in May and the post-monsoon months. The variation in the rainfall from year to year is not large. Considering the district as a whole, during the fifty-year period from 1901 to 1950, the highest annual rainfall amounting to 127 per cent of the normal occurred in 1946. In the same fifty-year period, 1941 was the year in which the lowest annual rainfall amounting to 73 per cent of the normal was received. This was also the only year when the rainfall was less than 80 per cent of the normal. It will be seen from Table 2 that in 34 years out of 50, annual rainfall in the district was between 3,400 and 4,400 mm. Rainfall

On an average, on 123 days in a year the district gets rainfall of 2.5 mm. (10 cents) or more. As in the case of the amount of rainfall, the number of rainy days in a year increases from the coast towards the Western Ghats. The heaviest rainfall in 24 hours which occurred at any station in the district was 373.9 mm. (14.72") at Coondapur on 2nd July 1930.

The only Meteorological Observatory in the district is at Mangalore and records for this station are available for about seventy years. Temperature and other meteorological conditions Temperature

in the district can be taken to be represented by the data for Mangalore. Being a coastal district, the seasonal variations in the temperature are small. The south-west monsoon season is the coolest part of the year with the mean daily maximum temperature below 29° C (84°F). Although April and May may be considered to be the hottest months of the year as both day and night temperatures are higher than in the rest of the year, day temperatures remain high even during the period from December to February. The oppressive heat is often relieved by the comparatively cool sea breezes which blow in the afternoons. The highest maximum temperature ever recorded at Mangalore was 37.8° C (100.0°F.) on February 28, 1920 and the lowest minimum was 16.7° C (62.0°F.) recorded on January 13, 1911, February 8, 1911 and December 10, 1950.

Humidity

The air is highly humid all through the year and particularly so in the south-west monsoon months.

Cloudiness

Skies are heavily clouded or overcast on most days in the south-west monsoon season. The number of such heavily clouded days are fewer in the post-monsoon months of October and November. In the rest of the year, skies are generally lightly clouded or clear.

Winds

Winds are strong and are mainly westerly or south-westerly in the south-west monsoon months. In the rest of the year, winds are mainly from directions between north and east in the forenoons and westerly or north-westerly in the afternoons.

Special weather phenomena

Thunderstorms occur on three to six days in a month during the period from April to June and on five to seven days in a month in the post-monsoon months of October and November. Squalls are possible in the latter part of the hot season and the early part of the south-west monsoon season. In association with storms in the Arabian sea in the months of April, May and June and to a greater extent in the post-monsoon months of October and November, the district gets heavy rainfall and high squally winds all along the coastal regions.

Tables 4, 5 and 6 give the temperature and humidity, mean wind speed and frequency of special weather phenomena respectively for Mangalore.

TABLE I

Normals and extremes of Rainfall in South Kanara District

Stations	No. of Years of data	Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sept.	Oct.	Nov.	Dec.
		1	2	3	4	5	6	7	8	9	10	11	12
Mangalore ..	50 a	4.8	2.5	8.9	35.3	177.5	966.7	1019.6	607.1	272.0	208.0	79.8	15.7
	b	0.3	0.2	0.5	2.1	7.2	24.7	27.6	25.1	16.0	10.2	4.8	0.9
Belthangady ..	50 a	5.6	2.3	8.6	51.1	151.9	967.4	1572.0	975.6	392.2	304.3	122.4	20.3
	b	0.4	0.1	0.7	3.3	7.4	24.7	29.1	27.1	18.1	13.5	5.9	1.2
Puttur ..	50 a	5.3	2.5	13.5	38.9	160.3	928.4	1237.7	772.4	297.9	277.1	111.5	16.8
	b	0.5	0.2	0.7	2.7	6.9	24.3	28.7	26.4	16.8	12.9	5.9	1.1
Udipi ..	50 a	3.6	3.3	3.3	29.7	141.5	995.9	1197.6	721.6	351.5	187.2	68.8	14.7
	b	0.3	0.1	0.2	2.0	5.8	25.1	28.2	26.0	17.4	9.0	3.8	1.0
Buntwal ..	50 a	6.1	1.3	6.3	33.8	143.5	1003.8	1225.3	732.8	290.3	223.0	85.3	21.0
	b	0.3	0.1	0.4	2.3	6.4	24.7	28.9	26.4	16.3	11.8	5.2	1.2
Baindur ..	50 a	1.3	0.8	2.3	23.9	121.4	1123.9	1361.7	823.2	395.2	201.2	73.4	9.1
	b	0.1	0.1	0.2	1.2	4.8	24.8	29.2	27.1	18.0	9.6	3.9	0.8
Mulki ..	50 a	5.1	1.8	3.3	35.8	162.3	984.5	1074.2	668.8	297.7	194.3	66.3	16.8
	b	0.3	0.1	0.3	1.7	6.7	24.7	28.2	25.6	16.4	9.9	4.0	1.0
Karkal ..	50 a	7.6	1.8	12.2	48.5	160.5	1108.5	1532.1	976.4	412.2	298.7	111.8	24.1
	b	0.4	0.1	0.8	3.5	6.9	25.5	29.5	27.6	18.8	13.8	6.2	1.5
Coondapur ..	50 a	1.5	2.5	3.8	25.7	126.5	1037.8	1211.3	698.3	349.8	156.2	66.0	13.5
	b	0.1	0.1	0.1	1.3	5.1	24.5	28.2	25.8	16.8	7.9	3.3	0.8
South Kanara District	50 a	4.5	2.1	6.9	35.9	149.5	1014.0	1270.2	775.1	339.9	227.8	87.3	16.9
	b	0.3	0.1	0.4	2.2	6.4	24.8	28.6	26.3	17.2	11.0	4.8	1.1

Stations	Annual	Highest annual rainfall as % of normal and year**	Lowest annual rainfall as % of normal and year**	Harvest rainfall in 24 hours*		
		15	16	17	18	19
				Amount(mm.)	Date	
Mangalore ..	3,397.9 119.6	138 (1946)	72 (1941)	360.9	1909 May 8	
Belthangady ..	4,582.7 131.5	130 (1923)	72 (1915)	359.9	1941 Jun. 11	
Puttur ..	3,862.3 127.1	127 (1946)	75 (1944)	336.0	1887 Oct. 9	
Udipi ..	3,718.7 118.9	128 (1902)	59 (1941)	276.1	1902 July 30	
Buntwal ..	3,772.8 124.0	130 (1946)	77 (1913)	290.8	1946 Aug. 7	
Baindur ..	4,137.4 119.8	146 (1948)	68 (1911)	346.5	1955 May 21	
Mulki ..	3,510.9 118.9	135 (1929)	65 (1941)	303.5	1909 May 8	
Karkal ..	464.4 134.6	127 (1946)	85 (1941)	302.0	1923 June 24	
Coondapur ..	3,692.9 114.0	135 (1946)	66 (1941)	373.9	1902 July 30	
South Kanara District ..	3,930.1 123.2	127 (1946)	73 (1941)	

(a) Normal rainfall in mm. (b) Average number of rainy days (days with rain of 2.5 mm. or more).

* Based on all available data upto 1957 ** Figures given in brackets are years.

TABLE 2

Frequency of Annual Rainfall in South Kanara District

Data 1901-1950

<i>Range in mm.</i>	<i>No. of years</i>	<i>Range in mm.</i>	<i>No. of years</i>
2,801-3,000	.. 1	4,001-4,200	.. 10
3,001-3,200	.. 3	4,201-4,400	.. 6
3,201-3,400	.. 3	4,401-4,600	.. 7
3,401-3,600	.. 7	4,601-4,800	.. 1
3,601-3,800	.. 6	4,801-5,000	.. 0
3,801-4,000	.. 5	5,001-5,200	.. 1

TABLE 3

Statement of taluk-wise actual annual rainfall in South Kanara District from 1951 to 1970

(in Millimetres)

Name of taluk	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
1. Mangalore ..	2,942.8	2,185.9	2,892.5	3,762.4	3,816.3	3,609.2	3,152.2	3,430.5	3,945.3	3,474.0	4,783.1
2. Belthangady ..	4,021.5	4,773.6	3,970.8	4,566.5	4,251.4	5,032.5	4,210.3	4,548.5	5,144.8	4,422.9	6,953.9
3. Coondapur ..	4,007.	3,236.0	3,562.8	4,136.5	4,488.5	4,331.3	3,632.2	4,080.8	4,986.5	3,895.9	5,897.2
4. Udipi ..	3,555.3	3,446.1	3,155.9	4,654.0	4,834.7	4,053.0	3,719.5	3,819.8	5,642.4	5,286.4	6,335.7
5. Karkal ..	3,953.1	4,563.6	4,445.5	5,036.3	4,619.7	5,112.8	4,593.9	5,498.7	6,040.7	5,334.7	6,464.2
6. Buntwal ..	3,420.1	3,392.0	3,573.6	4,139.6	3,186.2	3,978.0	3,532.9	3,364.2	4,614.5	3,623.8	6,084.1
7. Puttur ..	3,126.4	3,393.4	3,314.0	3,186.4	3,749.2	4,252.4	3,556.7	3,666.7	5,075.3	4,501.9	7,205.0
8. Sullia ..	(No rain gauge station)										
	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
1. Mangalore ..	3,836.7	3,180.3	2,671.9	2,932.9	2,858.3	3,380.6	3,782.0	3,034.5	4,228.1	4,069.2	2,989.2
2. Belthangady ..	1,079.4	3,995.6	3,998.6	3,584.2	3,309.5	4,027.8	4,997.7	4,889.5	5,129.2	4,303.3	4,058.2
3. Coondapur ..	4,323.0	3,785.5	3,032.8	3,012.8	3,023.2	3,436.9	3,967.2	3,429.8	4,734.5	4,068.8	3,214.3
4. Udipi ..	4,383.5	3,666.9	2,847.7	2,944.9	3,006.2	3,945.6	4,237.2	4,142.2	4,790.1	4,537.7	3,396.8
5. Karkal ..	5,484.4	3,269.3	3,896.3	3,277.3	4,113.0	4,467.0	5,509.0	4,527.0	5,010.8	6,421.0	3,971.6
6. Buntwal ..	4,472.3	3,595.8	2,938.9	3,360.5	2,834.1	3,751.0	3,959.2	3,810.9	4,875.7	4,092.9	3,604.0
7. Puttur ..	5,029.6	4,256.4	3,427.1	3,485.9	3,365.8	4,003.7	4,746.4	4,369.9	5,231.7	4,102.1	3,845.9
8. Sullia ..	(No rain gauge station)										

Source: Bureau of Economics and Statistics, Bangalore.

TABLE 4

Normals of Temperature and Relative Humidity at Mangalore

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	31.6	21.5	36.1	1957 Jan. 21	16.7	1911 Jan. 13	69	63
February	31.2	22.6	37.8	1920 Feb. 28	16.7	1911 Feb. 8	74	67
March	32.0	24.4	37.3	1958 Mar. 7	18.3	1911 Mar. 4	75	68
April	32.8	25.9	35.6	1921 Apr. 28	20.0	1954 Apr. 23	72	69
May	32.6	26.1	36.7	1921 May 2	18.9	1911 May 6	75	72
June	29.2	23.8	34.4	1923 Jun. 5	20.0	1920 Jun. 16	88	87
July	28.6	23.5	31.7	1954 Jul. 25	20.6	1931 Jul. 25	90	89
August	28.7	23.5	32.2	1932 Aug. 26	20.6	1911 Aug. 12	91	88
September	28.9	23.5	31.7	1955 Sep. 23	21.1	1950 Sep. 9	88	85
October	30.0	23.7	34.4	1941 Oct. 31	20.0	1933 Oct. 23	84	79
November	31.1	23.2	35.6	1941 Nov. 3	18.3	1950 Nov. 30	76	72
December	31.7	21.8	35.0	1953 Dec. 1	16.7	1950 Dec. 10	68	63
Annual	30.7	23.6					79	75

*Hours I.S.T.

TABLE 5

Mean Wind Speed in Km./hr. at Mangalore

<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>Apr.</i>	<i>May</i>	<i>June</i>	<i>Jul.</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>	<i>Annual</i>
7.9	8.2	7.9	8.2	9.0	8.7	9.0	7.4	6.4	6.6	6.6	7.4	7.8

TABLE 6

Special Weather Phenomena at Mangalore

<i>Mean No. of days with</i>	<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>Apr.</i>	<i>May</i>	<i>Jun.</i>	<i>Jul.</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>	<i>Annual</i>	
Thunder	..	0.0	0.3	0.5	4.1	5.8	3.7	1.0	0.4	0.9	6.9	5.3	1.2	30.1
Hail	..	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Duststorm	..	0.0	0.1	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.4
Squall	..	0.2	0.0	0.0	0.5	0.9	2.9	1.9	0.3	0.1	0.3	0.4	0.1	7.6
Fog	..	0.5	0.1	0.7	0.2	0.0	0.0	0.2	0.1	0.5	0.5	0.2	0.2	3.6