THE

COCHIN STATE MANUAL.

CHAPTER I.

PHYSICAL DESCRIPTION.

GENERAL DESCRIPTION: Situation, boundaries and area—Etymology of the name—Divisions—Towns—Physical aspects—HILLS: Western Ghats—Peaks—THE RIVER SYSTEM: The Alwaye or Periyar—The Chalakudi—Tributaries of the Chalakudi—The Karuvannur—The Ponnani—The Chittur—Minor streams—THE BACK WATER SYSTEM—FRESH WATER LAKES—ISLANDS—THE COAST LINE—PORTS: Cochin—Malipuram and Narakal—Cranganur—THE NARAKAL MUD BANK: Its origin and nature—SOILS—CLIMATE: Rainfall—Humidity—Temperature—Seasons—Winds—Natural calamities, etc.—Effects of the climate—GEOLOGY: Laterite—Minerals—FLORA—FAUNA: Big game—Small game—Domestic animals—Birds—Reptiles—Fishes.

GENERAL DESCRIPTION.

Situation, boundaries and area.

The native State of Cochin (Malayalam *Kocchi*) lies between 9° 48′ and 10° 50′ N. Latitude and 76° 5′ and 76° 58′ E. Longitude. It consists of two disconnected parts, the larger of which is bounded on the north by British Malabar, on the east by Malabar, Coimbatore and Travancore, on the south by Travancore and on the west by Malabar and the Arabian Sea. The smaller part, which covers an area of 105 square miles, comprises the chief portion of the Chittur Taluk and is entirely encircled by British territory—Malabar and Coimbatore. There are also similar isolated tracts, but of much smaller extent, which are entirely surrounded by Travancore, *viz.*, Vadavakode, Vellarapilli, Malayattur and Chennamangalam. Cochin, on the other hand, similarly encircles several isolated tracts of British and Travancore territories, and is in many places intermixed with those territories in a variety of manner. The State is thus singularly diversified in its configuration, and its boundary lines extend over a length of 500 miles. The total area of the State is 1417¾ square miles. *

* This is the area according to the recent cadastral Survey of the State. According to the Great Trigonometrical Survey the area is 1361½ square miles.

CHAPTER I. GENERAL DESCRIPTION.

Etymology of the name.

The State was originally known as Perumpadappu Nad, and the ruling family is still spoken of as Perumpadappu Svarupam. It is so called after the village of the same name * in the Ponnani Taluk of Malabar, which is said to have been the original seat of the family and where the coronation ceremony of the kings of Cochin used to be performed till the middle of the seventeenth century. The family was also known as Madattumkil Svarupam after the name of one of the extinct dynasties of Cochin, a name which now survives only in the language of Malayalam poets. The name Cochin appears to have been given first to the town which came into existence after the formation of the harbour in 1341, afterwards to the country in the immediate vicinity of the town, and finally to the whole territory under the rule of the Perumpadappu Svarupam. † No mention of Cochin is therefore found in the earlier notices of Malabar. Neither Pliny (A. D. 23—79) nor Ptolomy (A. D. 126—161) nor Periplus (3rd century A. D.), neither Marco Polo (A. D. 1290—93) nor Ibn Batuta (A. D. 1342—47) makes any mention of Cochin, though they give accounts, more or less detailed, of places situated to the north and south of it, such as Cape Comorin, Kallada, Cranganur, Kadalundi, etc. The first mention of Cochin, so far as known at present, is made, sixty years after the formation of the harbour, by Ma Huan, a Chinese Mahomedan attached to the suit of Cheng Ho, an envoy of the Emperor Yong-Lo to foreign countries, and the next mention is by the Italian traveller Nicolo Conti (A. D. 1440). These writers and those of the sixteenth and seventeenth centuries variously call the town Cocym, Cochym, Cochin, Cochi.

The word Kocchi is popularly supposed to be a corruption of the Sanskrit *go-sri*, 'prosperous with cows'. This is clearly one of those fanciful derivations of which the Aryan colonists of Southern India have, in their anxiety to give a Sanskrit origin to all Dravidian nomenclature, accumulated such a large stock. The first portion of the name is undoubtedly the Malayalam word *Kocchu*, meaning small or young, but what this

* Nediyirippu Svarupam or the Zamorin's family is similarly named after Nediyirippu, a village in the Ernad Taluk, and Trippapil Svarupam or the Travancore ruling family after Trippapur, a village about five miles to the north of Trivandrum.

† In the treaty with the Dutch, dated 6th April 1698, there is a provision for the prevention of the smuggling of pepper from Kocchi-rajyam *and* Perumpadappu Nad. At this time, Cochin evidently comprised only the coast tract in the neighbourhood of the town.

word qualifies can only be conjectured. In the *Kerala Mahatmyam* and other recent Sanskrit works, the town is called *Balapuri*, small or young town, but Nicolo Conti writing in the 15th century and Fra Paolino in the 17th say that it was called Kocchi after the small river that flowed by that place, that is, the river that connects the back-water and the sea I would therefore hazard the conjecture that the word is a contraction of *Kocchazhi*, * the small or new harbour, as distinguished from the large or old Cranganur harbour, which was frequented for centuries by merchants from all parts of the world.

Divisions.

For administrative purposes, Cochin is divided into five Taluks, *viz.*, Kanayannur-Cochin, Mukundapuram, Trichur, Talapilli and Chittur. In addition to these, there is also the tiny principality of Cranganur under a Chief paying tribute to Cochin. This principality is financially autonomous, but is in all other respects administered as one of the Taluks of the State. The head quarters of the Taluks are Ernakulam, Irinjalakuda, Trichur, Vadakancheri and Chittur respectively. The five Taluks and Cranganur are further subdivided into 165 revenue villages.

The State was in olden times divided into *Nads* and *Desams* administered by hereditary Chiefs called *Naduvazhis* and *Desavazhis*. These divisions were broken up in the latter half of the 18th century, when the Chiefs were divested of their power, and the State was in 1762—3 divided into ten *Kovilakattumvatals* or Taluks. The number was reduced to six in 1840 by the amalgamation of the Chelakara and Mullurkara Taluks with Talapilli, Enamakal with Trichur, and Kodasseri with Mukundapuram. By the amalgamation of the Taluks of Kanayannur and Cochin in 1907 a further reduction was made in their number.

Towns.

The chief towns are Ernakulam, Mattancheri and Trichur. For administrative purposes, Irinjalakuda, Kunnamkulam, Chittur and Tattamangalam are also treated as towns. There are no large towns in the State, and only the first two have a population of 20,000.† Towns are of comparatively recent origin in Cochin as on the West Coast generally, and their growth is mainly due to the influence and example of foreign settlers. While the people of other parts of India love to congregate in closely built villages,

†Ernakulam	21,901
Mattancheri	20,061
Trichur	15,585
Irinjalakuda	8,420
Chittur	8,095
Kunnamkulam	7,194
Tattamangalam	6,222

* As another instance of a similar contraction may be mentioned Chetva, which was formerly known as Chettuva-azhi.

CHAPTER I. GENERAL DESCRIPTION.

close neighbourhood is repugnant to the genius of the Malayalis, who are averse to living in houses not standing in their own premises. If a cluster of closely built houses is seen anywhere on this Coast, it can at once be understood to be the quarters of non-Malayali Hindus, native Christians or Mahomedans. But for these people, towns that can properly be called such would probably not have sprung up on this side of the ghats.

Physical aspects.

Small as the State is, it is as singularly diversified in its physical aspects as in its configuration. It is divided into three well-defined parts or zones—the hills, the plains and the sea-board. The hilly or eastern portion, which covers nearly half the extent of the State, is broken by long spurs, extensive ravines, dense forests and tangled jungles, rising terrace by terrace to an elevation of 5,000 feet above the sea level. It is covered almost throughout with magnificent forests of teak and other valuable trees, and exhibits everywhere a splendid luxuriance of foliage and flowers. Stretching westward, in gentler slopes and gradually widening valleys, but broken here and there by isolated low hills, the plains succeed the forest-clad uplands. Intersected by numerous rivers and streams, dotted everywhere with home and farmsteads, and closely cultivated, wherever possible, these plains stretch towards the back-waters in a succession of gentle undulations. Between the back-waters and the sea is the long and narrow stretch of sandy sea-board densely covered with luxuriant cocoanut palms, and in places where there are natural or artificial embankments, large quantities of rice are grown. The sea-board is low and generally swampy, and is, in several parts, liable to be flooded during the monsoon inundations. Detached from these three zones is the isolated tract of the Chittur Taluk situated within the Palghat gap and with meteorological conditions different from those of the rest of the State. This tract is overlooked on either side by the Vadamala and Tenmala ranges, rugged and massive, with the giant Nilagiris and Anamalais towering in the back ground.

HILLS.

Western Ghats.

That portion of the Western Ghats which forms the eastern belt of the State constitutes its chief mountain system. It is composed of a succession of bluff ridges and conical peaks and presents in general a very irregular outline. Some of these lofty ridges and peaks are almost entirely detached (except near their bases) from the neighbouring heights, falling precipitously and followed towards the west by a succession of hills of gradually diminishing altitude. The chief ranges of hills that form the chain are the Nelliampati

and Pottundi in the Chittur Taluk, the Machad in Talapilli, the Paravattani in Trichur, the Palapilli, Kodasseri and Adirapilli in Mukundapuram and the Malayattur in Kanayannur-Cochin.* These ranges vary in height from a few hundred feet to about 5,000 feet above the sea level, and among the labyrinth of these ranges, there are some rough elevated tablelands to be found, the chief of which is the Nelliampati plateau with an average elevation of 3,000 feet. Karimalagopuram in the Nelliampati range and Vellani in the Paravattani range are less extensive plateaus, but the former has an average elevation exceeding 4,000 feet above the sea level and is therefore above the fever range. Besides these mountain ranges, there are several isolated hills of varying elevations that lie dotted here and there over the laterite plains. A few of them are well wooded, but most of them are altogether barren.

CHAPTER I. HILLS.

Nellikotta or Padagiri on the Nelliampaties, which is 5,200 feet high, is the loftiest peak in the State, and Karimalagopuram also has nearly the same altitude. Among the other peaks are Vellachimudi, Valiyavana Ridge, Myanmudi, Valavachan, Mulankunnu, Kuvayali and Vimpalakavala, each a little over 4,000 feet in height, and Pannimudi, Nadukani, Sherunelli, Valiyalavara, Tottivara and Kantalpara, each over 3,000 feet high. The chief peaks of Paravattani are Vellani, Tirumani and Ponmudi; of Machad, Kodikuttiyakunnu; of Kodasseri, Kodasserikoomban and Kumbitanmudi; of Palapilli, Pandimudi, Kunpancheri and Irulumala; and of Malayattur, Kurisumudi. On the last peak is situated an important Romo-Syrian Church of some antiquity.

Peaks.

Cochin has for its area an extensive river and backwater system. This has contributed in so small measure to the early development of the country, as it afforded an admirably easy and cheap means of communication at an age when wheeled traffic and even pack-bullock traffic were unknown. Owing however to the shortness of the distance between the mountains from which the rivers rise and the sea into which they fall, most of the rivers are little more than jungle streams, and the number of perennial streams, navigable throughout the year, is very limited. The chief rivers are the Alwaye, the Chalakudi, the Karuvannur, the Ponnani and the Chittur.

THE RIVER SYSTEM.

The Alwaye or Periyar, 142 miles in length and navigable for nearly 60 miles, is really a Travancore river, but where it is at its best, namely between Malayattur and Alwaye, it forms the boundary between Travancore and Cochin

The Alwaye or Periyar.

* For the division of these ranges for administrative purposes, see Chapter V.

CHAPTER I. THE RIVER SYSTEM.

for about 16 miles. The water of this river is believed to have medicinal virtues and to remove the ill effects of biliousness, prickly heat and boils and even to reduce elephantiasis. Consequently, Chovara, Alwaye and Thottumukham, all in the vicinity of the Railway Station, where the stream is broad, gentle and shallow, with very fine and smooth sands and with the banks dotted with neat little bangalows, are largely resorted to by people from Cochin, Ernakulam and Trippunittura during the hot months of March, April and May to enjoy bathing in the cool and limpid water of the river. These villages are in fact the sanitaria of Cochin and were used as such by the Portuguese and the Dutch during their palmy days.* At Alwaye, the river is crossed by the Cochin State Railway by means of a handsome bridge of nine 80 feet spans on piers sunk into the solid rock. Close under the bridge, the river divides itself into two branches, one flowing in a north-westerly direction into the back-water to the east of the Cranganur bar, and the other taking a southerly direction and joining the back-water near Verapoly. A branch again from the latter flows to the south and discharges itself into the back-water to the north of Trippunittura.

The Chalakudi.

The Chalakudi river rises from the ghats beyond the Kodasseri forests and flows through wild and mountainous country as far as Kanjirapilli, a distance of about fifty miles. Thence it takes a tortuous course of about twenty miles through picturesque and fertile tracts and between high banks dotted with houses and cultivated plots, and empties itself into the right arm of the Alwaye at Elantikara, about six miles to the east of Cranganur. This river is formed by the junction of the Parambikolam river with the Kuriyar or Nelliampati river near Kuriyakutti and with the Sholiyar near Orukombankutti, a station on the Forest Tramway about thirty miles up Kanjirapilli. Its flow, till it reaches the plains, is broken by innumerable rapids and falls, the chief of which is the picturesque fall at Adirapilli, an almost vertical drop of over a hundred feet, a magnificent spectacle, especially in the monsoon time. The water of the Chalakudi, though good, is not so clear and light as that of Alwaye, and the river is not therefore so much resorted to as the latter in the hot season. It is navigable as far as Kanjirapilli, and near the Chalakudi Railway Station, it is crossed by a fine iron girder bridge of four 80 feet spans.

Tributaries of the Chalakudi.

The Parambikolam, the Kuriyar and the Sholayar, though only tributaries of the Chalakudi, deserve separate mention

* Here, the Portuguese had a celebrated bathing place, called Fiera d' Alva.

owing to the picturesqueness of the scenery presented by them. They take their rise in the ghats beyond the Cochin frontier, and flow through primeval forests abounding in trees of gigantic growth. They are full of cataracts and waterfalls, and their banks are everywhere luxuriantly covered with foliage and flowers.

The Karuvannur.

The Karuvannur river is formed by the junction of the Manali and Kurumali at Parakadavu, and discharges itself partly into the Manakodi lake and partly into the Chetva back-water. The Manali takes its source in the Paravattani hills and flows in a south-westerly direction, while the Kurumali rises in the Palappilli hills and takes a westerly direction, being joined in its course by the Muppulli and the Vembodian from the Kodasseri hills. These rivers dry up during the hot season, but they are useful for floating timber during the monsoon months, and for irrigating certain lands by means of temporary dams thrown across them. The total length of the river is nearly 40 miles, and it is navigable for about 15 miles for half the year. Both the Manali and Kurumali are crossed by iron girder railway bridges, and after their junction, the river is crossed by a masonry road bridge at Karuvannur.

The Ponnani.

The Ponnani or Bharata river, the largest on the Malabar Coast, forms the boundary between Cochin and British Malabar for about 25 miles, and receives numerous streams rising from the Cochin forests. One of its chief tributaries is the Cherukuzhi or Padur river in Pazhayannur, which is the continuation of a stream coming down from the Tenmalai range through Nemmara and the Palghat Taluk and joins the Ponnani at Kuttampilli near Tiruvilvamala. The Ponnani is useful to the State as a convenient outlet for the timber extracted from the Pottundi and Machad forests. The State Railway crosses the river at Shoranur by means of iron girder bridge of fifteen 60 feet spans, which was constructed as a road bridge over forty years ago.

The Chittur.

The Chittur is that portion of the Anamalai river that meanders through 15 miles of Cochin territory in a broad bed of rock and sand. This river and the minor streams that pass through the Chittur Taluk, namely, the Korayar, the Varattar and the Velantavalam, have a gradual fall of about 200 feet from the Pollachi frontier on the east to the Palghat frontier on the west, and this natural advantage in level has been largely availed of by the Government and the ryots for irrigation purposes by the construction of anicuts across them. All these rivers fall into the Ponnani.

CHAPTER I. THE RIVER SYSTEM.

Minor streams.

Besides the above, there are several minor streams which are made use of for irrigating wet lands by means of temporary dams thrown across them. The chief of them are the Vadakancheri, 27 miles long, and the Viyyur, 15 miles long, which rise respectively in the Machad and Paravattani hills, and pour their contents into the Enamakkal lake. The Peranda, the Olipara, the Ayilur and the Kudallur are small streams that drain the lower reaches of the Nelliampaties and the Pottundies and pass through the Nemmara portion of the Chittur Taluk in their course to the Ponnani river through the adjoining British territory.

THE BACK-WATER SYSTEM.

One of the most striking features of the country is the continuous chain of lagoons or back-waters running parallel to the sea and receiving the drainage of the streams descending from the ghats. These back-waters, with their subsidiary canals, extend far away north as far as Ponnani and south as far as Trivandrum, and also send numerous branches towards the interior. They are very irregular in form, with a breadth which ranges from four miles to forty yards, and branch out into a number of intricate and shallow channels, containing several low alluvial islands. The back-waters are at their best both in point of breadth and in point of depth between Cranganur and the southern frontier of Cochin, while those towards the north and the branches running to the interior are generally narrow and shallow. But almost throughout their length, they are navigable for all sizes of country boats throughout the year. Communicating as they do with the sea at three points, viz., Cochin, Cranganur and Chetva, they are affected by the flood tides twice in every 24 hours, when they rise about two feet and flow at the rate of $2\frac{1}{2}$ miles an hour, except during the monsoon months, when the rapidity is according to the volume of the freshes. The water is salt, but during the rainy season it is almost fresh except in the vicinity of the openings into the sea. The banks are low and generally marshy, and the bed a slimy mixture of black mud and dark sand. The shore on either side is densely covered with cocoanut and betel-nut palms or else is a succession of paddy fields.

The sea originally extended as far as the eastern shore of the present line of back-waters, and the tract of land between the latter and the sea, and the back-waters themselves came into existence in comparatively recent times by the antagonism between the rushing waters of the rivers and the littoral currents of the sea. "There being no lakes, in the still waters of which the rivers might clear themselves of the earthy matter swept along in their rapid course from the hills, they arrive at

the beach laden with sand and alluvium, and at their junction with the ocean, being met traversely by the gulf streams, the sand and soil with which they are laden, instead of being carried out to sea, are heaped up in bars along the shores, and these, being augmented by similar deposits held in suspension by the currents, soon extend to north and south, and force the rivers to flow behind them in search of a new outlet. These formations once commenced, their growth proceeds with rapidity. At the mouth of the rivers, the bars thus created generally follow the direction of the current, and the materials deposited, being dried and partially consolidated in the intervals between tides, long embankments are gradually raised, behind which the rivers flow for considerable distances before entering the sea. Occasionally, these embouchures become closed by the accumulations without, and the pent-up water assumes the appearance of a still canal, more or less broad according to the level of the beach, and extending for miles along the coast, between the mainland and the new formations. But, when swollen by the rains, if not assisted by artificial outlets to escape, they burst new openings for themselves; and not unfrequently they leave their ancient channels converting into shallow lagoons, without any visible exit". * In this manner were formed the back-waters and sea-board tracts of Cochin. The tract between the Cranganur and Chetwa bars, called *Manappuram*, was the first to come into existence, and that long before the Christian era, as Cranganur was known to the Phoenicians, Greeks and Romans as an emporium of trade. The tract between Cochin and Alleppey, called *Karappuram*, was formed some centuries later, as it appears from the descriptions of Pliny and Ptolemy that it was not in existence in the first century A. D., while the island between the Cochin and Cranganur bars, called Vaipin or *Pudu Vaipu*, was formed only in the fourteenth century. †

FRESH WATER LAKES.

There are several fresh water lakes in the State, of which the chief are the Enamakal and the Manakodi in the Trichur Taluk, the Muriyad in Mukundapuram, and the Kattukampal in Talapilli. The first two are connected with each other, and have a combined area of over 25 square miles, of which about 2½ square miles belong to the Malabar District.

---

* Sir James Emerson Tennent's *Sketches of the Natural History of Ceylon*.

† The names of these tracts are significant of their history. *Manappuram* means sand-bank, *Karappuram*, accreted land, and *Pudu Vaipu*, new deposit There are villages on the eastern bank of the back-water whose names are similarly significant; *e. g.*, *Kadamakudi* or *Kadalorakudi*, meaning sea-side settlement, and *Ezhikara* or *Azhikara*, meaning sea-shore (village).

CHAPTER I. FRESH WATER LAKES.

These two lakes, which are fed by the Karuvannur, Viyyur and Vadakancheri rivers, channel out into the back-waters at two points—Enamakal in the north and Chirakal in the south—where bunds are put up to prevent the ingress of salt water during the hot season. At the commencement of the hot weather, these lakes are drained by means of steam pumps and Persian wheels, and the whole bed is cultivated with paddy. The Muriyad lake, which is much smaller in extent than the above, is fed by several small streams, and its surplus waters flow into the Karuvannur river during the monsoon months. It is also cultivated in the same manner as the Enamakal lake. The Kattukampal is a large irregular lake, of which only a small portion lies in Cochin territory, the rest being in the District of Malabar.

ISLANDS.

The back-waters in the Kanayannur-Cochin Taluk are throughout dotted with islands, the chief of which are Mulavukad, Kadamakudi, Cheranellur and Kumbalangi, each about four square miles in extent, Edakochi, Kumbalam, Cheppanam, Vendurutti and Chennamangalam, each about a square mile. Among the smaller islands, each less than a square mile in extent, are Vallarpadam, Cheriyakadamakudi, Kothat, Mulampilli, Chennur, Kandanad and Karikad. Pullut, three square miles in extent, and Panikanturut, 56 acres, form part of the Cranganur Taluk, while Arimbur, about 9 square miles, and Pullu, 1½ square miles, are picturesque islands in the Enamakal-Manakodi lake. Most of the islands in the back-waters were formed by the deposit of alluvium brought down by the rivers during the monsoons. They are generally low and swampy, and favour the luxuriant growth of cocoanut palms.

THE COAST LINE.

The coast line trends from north-north-west to the south-south-east through a length of 35 miles, of which a mile near the Cranganur bar lies in Travancore and over half a mile near the Cochin bar in British territory. The prevailing littoral current is from north to south, but is nowhere very strong, and consequently deep water is not to be found anywhere close in shore. The sea-board is an unbroken stretch of sand and is pretty open, and there is no indentation worthy of the name of harbour. But there are outlets from the back-water to the sea at Cochin and at Cranganur, which afford refuge to small crafts with shallow draughts of water by enabling them to cross the bar, especially the one at Cochin, and to load and discharge their cargo in smooth water. Vessels of modern tonnage have to lie in the open roadstead, but during the monsoon months it is unsafe for vessels to beat about on this

unsheltered coast owing to the heavy roll of the sea and the great violence of the wind. All vessels have then to take refuge in the smooth water anchorage, known as the mud bay or mud bank, at Narakal.

PORTS. Cochin.

The ports of Cochin are Cochin, Malipuram, Narakal and Cranganur. Although the first of these ports lies entirely in the British District of Malabar, it is included in this list, as almost the whole sea-born trade of the State passes through this port, and its improvement and development are of more importance to Native Cochin than to British Malabar. It is the third largest trading port in Southern India, with imports and exports valued 239 and 298 lakhs of rupees respectively, and an average tonnage of eight lakhs frequenting it per annum.* The port consists of an outer roadstead and an inner harbour with a large expanse of back-water behind it. The inner harbour, which is the river connecting the sea and the back-water, and dividing Cochin from Vaipin, is half a mile long and 680 yards wide opposite the flagstaff, and has a depth of 30 to 40 feet. This depth is created and maintained only where the scour from the back-water is concentrated, but seaward of the flagstaff the outgoing current spreads latterally, the only controlling influence being the submerged sandbanks, which reach for a distance of nearly a mile from the shore. At this spot, where the outgoing currents meet the onshore seas, a bar is created in a semi-circular form from the shoal water off Vaipin point to that off Cochin point. As the bar carries only a depth of twelve to eighteen feet of water and as it extends seaward for about a mile and a half, vessels of great draught cannot cross to the inner harbour, but have to lie about $2\frac{1}{2}$ miles off shore. As the removal of the bar would make Cochin one of the finest harbours in the world, proposals were made nearly thirty years ago to prevent the bar forming by the construction of groynes on either side of the entrance to the back-water, which, it was thought, would confine the current and keep open a channel by scour in the same way that the entrance to the back-water is now kept open. These proposals were however held to be impracticable, but fresh ones were made in 1902 to construct on the side of the back-water two wharves, each 1,000 feet long, for the loading and shipment of goods, and to dredge a channel, 30 feet deep below low water spring tides, from the present anchorage through the bar and up the back-water to the position adopted for the wharves. When expert opinion was taken in England on these proposals, it was found that the

* These figures are for 1908—9.

CHAPTER I. PORTS.

cost of constructing a sheltered harbour in this manner would be altogether prohibitory, and the Government of Madras were therefore "reluctantly compelled to abandon the scheme until time and circumstances revealed a practicable means of improving the harbour". *

Malipuram and Narakal.

Malipuram and Narakal are open roadsteads, which are generally resorted to only during the monsoon months, when the shipping from Cochin takes refuge at the mud bank of Narakal. There is a flagstaff at Malipuram, from which light is exhibited only from the middle of May to the end of September. The usefulness and importance of these ports consist in their being necessary adjuncts to the port of Cochin. The mud bank has however recently extended seaward a little, and its value as an anchorage has been correspondingly impaired.

Cranganur.

Cranganur, the Mouziris of the ancients and described by Pliny as *Primum emporium Indiae*, had been a very important port for over twenty centuries, but it has almost ceased to be a port now. The mouth of the river or the inner harbour is being blocked up by sand banks and alluvial islands formed by the conflict of the sea and the river, and only small boats can enter the harbour now. No vessels call at this port now to load or unload goods, except a few native crafts from Bombay with their cargo of salt consigned to Travancore. These vessels have to stand off at sea, as they cannot enter the harbour for want of water, and the salt is brought in small boats to the depot at Pallipuram. The southern bank of the mouth or inner harbour as well as a part of the northern bank is Travancore territory.

THE NARAKAL MUD BANK.

There are some smooth water anchorages on the west coast known as mud banks or mud bays, the chief of which are those of Narakal and Alleppey. The bottom of these anchorages consists of the very finest mud, greenish black in colour and very unctuous to the touch, and during the monsoon this mud rises from the bottom of the sea, becomes dispersed in the water and effectually stills the surf. Ships can then ride safely in these roads, and load and discharge cargo in clear water on the open coast all through the south-west monsoon season. The mud

* Madras Government Orders, Nos. 150 and 308, dated 4th March 1902, and 13th July 1903 respectively. Several distinguished personages who have visited the harbour, Lords Curzon, Kitchener and Ampthill among others, have been very favourably impressed by its natural advantages and have thought highly of its possibilities. In the opinion of local merchants and engineers the cost of improving the harbour will not be prohibitory, as they confidently expect a sufficiently large income to cover the interest on the required outlay, specially now that the railway has been extended to Ernakulam.

flat at Narakal extends about three miles along the shore from south to north and four and a half miles out to sea. This bank does not seem to have shifted its position at any time to any great extent, while the Alleppey bank is said to have moved about fifteen miles during the last two hundred years.

Its origin and nature.

The nature and origin of this singular phenomenon have not yet been fully investigated. Of all the investigations hitherto made, Dr. King's seems to be the most thorough and valuable, and the following is a brief summary of the results of his investigation.* The mud of these banks is full of organic matter and contains a sensible amount of oil, some of which may have been derived from the decomposition of these organisms. In all seasons it is easily stirred up, and it never settles down into a uniformly compact deposit, but has an upper stratum in a greater state of liquidity than its lower depths. The water over the mud is known to calm down only after the south-west monsoon has commenced, and there has been a stirring up of the sea and mud. The quieting of the waters is intensified according to the amount of rainfall during the monsoon, and the calmness continues throughout the monsoon, apparently without any fresh stirring up of the mud. The water is subject at times to considerable agitation through the bursting up of great bubbles of water, mud or gas—it is not quite clear which—, when the water over the banks becomes considerably freshened, and also gives off fetid odours. At such times the fish inhabiting it are killed off in large numbers; but whether owing to the freshening of the sea-water or the exhibition of poisonous matter and vapour is not clear: perhaps, it is due to both causes. The soothing of the surf is to be attributed to the oily constitution of the mud, as experiment has confirmed the traditionally understood action of oil on troubled waters. But the amount of oil derivable from the decomposition of the animal and vegetable matter of the organisms in the mud would be hardly sufficient to account for the features exhibited; hence it is necessary to look to other sources for the oil, and even for the continued supply of the mud itself, which is entirely carried away and distributed by littoral currents. There is evidently an underground discharge of water into the sea from the backwater behind Narakal during flood time, the inland waters being at a higher level than the sea. This passage of underground water must, more particularly during heavy rains, force out large quantities of mud, while a continuous, though very small,

* *Considerations on the smooth water anchorages or mud banks of Narakal and Alleppey on the Travancore coast*, by W. King, B. A., D. Sc., Deputy Superintendent, Geological Survey of India—Records of the Geological Survey of India, Vol. XVII.

CHAPTER I. THE NARAKAL MUD BANK.

stream of the same oil and mud may be kept under the lower pressure of ordinary back-water level. Not only would the underlying sludge and its product be forced out, but it is conceivable that the mud from the back-water should find its way into the same vents, and for a time replace that carried off in the first instance, oil and gas being absorbed in it during that time of replacement. The presence of petroleum seems to be accountable by the fact that, besides the alluvial deposits, large lumps of clay or compacter mud and vegetable remains in a more or less decayed form are brought to the surface during the prevalence of the ebullitions. Such clays occur in the Varkala deposits associated with lignite beds, in which occur trunks and roots of trees in every stage of decay. It may well be that these Varkala deposits extend northwards under the Alleppey-Porakad and Narakal alluvium and that it is from these deposits, as being deeper seated, older and lignitiferous, that the earth-oil is generated. Thus, the banks, their smoothening influence, and their position within certain ranges of the coast may be entirely due to (1) the discharge of mud from under the lands by the percolation or underground passage of lagoon water into the sea; (2) the presence in this mud of oily matter, derived perhaps in part from the decomposition of organisms, but principally from the distillation of oil in subjacent lignitiferous deposits belonging presumably to the Varkala strata; and (3) the action of littoral currents which, slowly and through long periods of years, carry the mud down the coast to certain points whence it is dissipated seawards.

SOILS.

The prevailing soil is a red ferruginous loam. At the foot of the ghats and the isolated portion of the Chittur Taluk, this loam is derived from gniess of a micaceous or hornblendic variety which is the chief underlying rock. On the slopes of the ghats, there is in several places an overlying layer of black mould formed of decayed vegetable matter. In the middle zone, which contains the major portion of the cultivated area, the soil is lateritic, being derived from a quartsoze variety of gniess. It is of course not uniform in quality, varying as it does from rich loam to uncultivable laterite. The soil of the level country near the back-water and the sea is generally arenacious, and consists of recent deposits of sand and mud, mostly due to river alluvium. In the Chittur Taluk, a layer of black cotton or regar series of soil is found in the valleys through which the Korayar and the Varattar rivers flow. The occurrence of this soil here seems to be due to the fact that these two rivers, which have their source in the black soil region

of the Pollachy Taluk, deposit on their banks during floods the soil brought down from that region.

The ryots in these parts divide the soils into three classes —*pasima*, *pasimarasi* and *rasi*—which correspond roughly to the soils of the three regions as above described. Pasima is a rich, tenacious soil, pasimarasi is the same with an admixture of sand, and rasi is sandy soil.

CLIMATE. Rainfall.

A heavy annual rainfall, a warm humidity of the atmosphere and a uniform temperature throughout the year as tested by the thermometer are the characteristic features of the climate of Cochin, as of the west coast generally. * The rainfall is not only heavy but fairly regular as to time and quantity, though not uniform in its territorial distribution. There is a gradual increase in the quantity of rainfall as we proceed from the coast towards the mountains, but Chittur, owing to its situation within the Palghat gap, is an exception, and receives much less rain than any other part of the State. While the mean annual rainfall is only 102 inches in Ernakulam, it is 132 in Trichur, and as much as over 150 on the Nelliampatis, but it drops down to 66 inches in Tattamangalam (Chittur). The abundance as well as the irregular distribution of the rainfall is caused by the Western Ghats, which arrest the lower strata of rain clouds brought up from the Indian Ocean by the periodical winds of the south-west monsoon and cause the rain to precipitate on the narrow stretch of country between them and the sea. The fall is heavier in the mountains owing to the cooling which the saturated current undergoes in its ascent, amounting to about 1° in each 400 feet, and causes the great precipitation on the face of the ghats. But the rain clouds passing through Chittur are not all arrested in this manner, as some of them escape through the gap to Coimbatore, and consequently Chittur receives less rain than the other parts of the State, and Pollachi, situated right opposite the gap, receives more rain than the tracts adjoining it on the other side of the ghats. The average number of rainy days during the year is 130 in Ernakulam, 145 in Trichur, 151 on the Nelliampatis and 100 in Tattamangalam.

---

* No meteorological observations, except rainfall, are officially recorded in the State. The figures relating to temperature, humidity, etc., given in this section, are those pertaining to British Cochin. The statistics of temperature relating to that town were kindly furnished by the Government Meteorologist, Madras. All the other figures and some of the facts have been taken from *The Climate and Weather of India, Ceylon and Burmah* by Dr. H. F. Blandford, F. R. S., F. R. Met. S.

CHAPTER I. CLIMATE.

The mean monthly and annual rainfall, derived from ten years' observation at three of the stations mentioned above, is given in the margin. It will be seen from it that December, January and February are the driest months, during which there is hardly any rainfall, that the extreme heat of March, April and May is slightly relieved by a few occasional showers, that June and July, which are preëminently the monsoon months, account for about 50 per cent. of the annual rainfall, and that the quantity of rain that falls in August and September, the months intervening between the two monsoons, is about equal to that falling in the north-east monsoon months, viz., October and November. This monthly distribution of rainfall is fairly uniform year after year.

Month	Ernakulam	Trichur	Tattamangalam
January	0·4	0·4	0·4
February	0·5	0·2	0·2
March	1·6	1·0	1·1
April	5·1	4·0	3·7
May	8·0	6·5	3·3
June	26·6	33·4	12·5
July	23·4	33·7	19·1
August	12·6	21·4	11·0
September	8·5	9·7	3·9
October	10·1	14·9	7·4
November	4·0	5·4	2·1
December	1·1	1·0	1·5
Total	101·9	132·5	66·2

Humidity.

Owing to the absence of a thick layer of cool earth on the surface, as in the temporate zone, capable of quickly absorbing the sun's rays, the surface soil becomes superheated, and by constantly radiating its heat by day and by night, maintains a comparatively high temperature. The ocean current which sweeps across from the African and Madagascer shores and the sea breeze which daily blows for several hours in the dry weather saturate the atmosphere with moisture, while the winds of the south-west monsoon roll before them dense masses of vapour. The atmosphere is thus in a more or less saturated condition throughout the year, and consequently the superfluous heat given off by the earth's surface is not radiated off into space, but is largely absorbed by the acqueous vapour by which the atmosphere is surchanged. Thus are created the heaviness of the atmosphere and the steamy heat which are so often felt on this coast. The mean humidity of the atmosphere is as much as 70 per cent. of saturation at the lowest and 88 per cent. at the highest, while the minimum and maximum in Coimbatore just on the other side of the ghats are only 52 and 75 per cent. respectively. The average cloudiness of the sky is 48 per cent. of the sky expanse.

Temperature.

Compensating advantages however are not wanting. The atmosphere of this coast, when it is hottest, is not so hot as that of the east coast when in the same condition, nor is the annual range of temperature, whether mean or absolute, so considerable. As the sea never becomes superheated like the land, the sea-breeze which blows regularly throughout the year moderates the intensity of the heat, while the country is shielded by the ghats from the desiccating winds of the Deccan tableland. Further, in the process of evaporation which goes on in the hours of the hottest sunshine from the sea, the rivers and the back-waters, a large amount of the heat becomes latent or insensible. On the other hand, during the monsoon months a fairly high temperature is kept up, notwithstanding the earth being screened by heavy clouds, by the condensation of the acqueous vapour and the consequent liberation of the heat. The annual mean maximum temperature, as observed from the readings of the last twenty years, is 87·4° and the mean minimum 75°, the annual mean being 81·2°. The mean highest and lowest temperature of the year being 95° and 67° respectively, the mean annual range is only 28°, but the absolute range of temperature is 37·4°, as the highest recorded reading is 98·3° (14th February 1894) and the lowest 60·9° (20th January 1902). *

Seasons.

The year is divisible into three seasons, the dry, the hot and the wet, and their rotation takes place with great regularity as a rule. The dry or dewy season begins with December and lasts for about two months and a half, when the mean temperature is 79° and the mean humidity is 72 per cent. The days are generally hot, but the nights, with dew fall more or less heavy, are fairly cool. The temperature is thus less uniform during this season than in the other two. In the latter half of February the mean temperature rises to about 81°, in March to 83° and in April to nearly 85°. In the first part of May, the temperature keeps up to the average of

* The peculiarities of climate disclosed by the above figures will be made more manifest if these figures are compared with those, say, for Madras.

	British Cochin.	Madras.
Annual mean temperature... ...	81·2	82
Mean highest	95	108
Mean lowest	67	60
Mean annual range of temperature ...	28	48
Highest recorded reading... ...	98·3	112·9
Lowest do	60·9	57·6
Absolute range of temperature ...	37·4	55·3
Mean humidity	80 per cent.	71 per cent.
Annual rainfall	115 inches	49 inches
Number of rainy days	16	95

CHAPTER I. CLIMATE.

April, but in the latter part, the heat is moderated by frequent showers. With the beginning of June, the south-west monsoon breaks out and the wet season commences. The months of June and July, when the mean temperature falls to 77°, are characterised by heavily clouded skies, copious rainfall, frequent squalls and high humidity. In August and September and during the north-west monsoon months of October and November, there are frequent showers of rain, but they are neither so heavy nor so continuous as those of June and July. The average temperature of this period is the same as that of the dry season, but it is much more equable. Though the seasons rotate in the order above described, some remarkable deviations from it are sometimes observed. The highest temperature is generally recorded in April and May and the lowest in December and January, but in 1892, 1893 and 1896, the highest temperature was recorded in January, and in 1906 the lowest was in August.

Winds.

From June to November, the south-west monsoon winds of greater or less intensity prevail in the Arabian Sea, and they usually set in on this coast in the beginning of June. They have their greatest extension and also the greatest intensity in July and August. They begin to fall off in strength in September and continue to decrease in intensity in the south of the Arabian Sea in October and November, but withdraw gradually during these months from the north and centre of the sea area, being replaced by light variable winds. From December to May, the air motion consists of an alternating movement between land and sea (land and sea-breezes) and of a feeble general movement from directions between north and west. The land winds begin at sunrise and subside before noon, while the sea winds begin at noon and subside soon after sunset. But as the season advances, the increasing temperature has the effect of gradually diminishing the period of the land winds and increasing that of the sea winds by an aggregate of about five hours. This rule does not however hold good fully in regard to that part of Malabar and Cochin which faces the Palghat gap. During December and January when north-east winds obtain in the centre and south of the Bay of Bengal and the air movement is continued across the Deccan, Mysore and South Madras, the west coast in general is sheltered from these winds by the ghats, but they blow violently through the gap across the territory situated between 10° 25' and 10° 55', N. lat. These land winds blow impetuously for about two months, and sometimes almost

continuously during day and night They are very dry winds, and though it is unpleasant to be exposed to them, they are in no way deleterious. It is believed that the strength and intensity of these winds are proportionate to the severity of the monsoon rains. *

Natural calamities, etc.

Cochin has not for many years experienced natural calamities of any great magnitude. Owing to the copiousness and regularity of the rains, the State has hitherto escaped the horrors of actual famine. There is no record of any destructive earthquakes having been experienced here. The greatest shock that was felt within living memory was that of the 8th February 1900, a shock which was felt throughout Southern India. Though monsoon inundations occur frequently in the low lying tracts, destructive floods are of rare occurrence. The most important floods that occurred in recent years were those of 1882 and 1907: in the former year all the rivers in the State and in the latter the Chalakudi and the Karuvannur overflowed their banks and did considerable damage to crops and cattle, but few human lives were lost. Heavy squalls are not unfrequent during the monsoon months, but of great destructive storms there are no records. Hail storms are of very rare occurrence. Erosions of the sea-shore have occurred not unfrequently, the most serious of which in recent years was the one that took place in 1907 at Andikadavu about eight miles to the south of Cochin. In 1875 the back-waters broke through into the sea at the Cruze Milagre gap two miles south of Cochin, and it was apprehended that the breach, if left unattended to, would eventually silt up the Cochin harbour and destroy the Bolghatty island. It was filled up by the British Government with much difficulty and at much expense to which the Darbar contributed Rs. 30,000. Protective works are still maintained.

Effects of the climate.

The climate, though moist and often unpleasant, is not particularly unhealthy. In fact, "the large absolute amount of moisture always present in the air is almost as congenial to the health of man as it is favourable to the growth and development of vegetation". † But the excessive humidity of the atmosphere renders the climate relaxing and debilitating, especially to Europeans and people of sedentary habits. The lower hills and parts of the Chittur Taluk are feverish during the dry months, while the sea-board tracts, probably owing to the unwholesomeness of the drinking water, breed elephantiasis. As for vegetable

* *Indian Meteorological memoirs*, Part I, Vol. X.

† *Natural Selection and Tropical Nature* by A. R. Wallace, p. 17.

CHAPTER I. CLIMATE.

life, " it is hardly necessary to remark that in such a climate the vegetation has all the luxuriance that is commonly associated with our ideas of the tropics. The strip of low plain that borders the greater part of the coast is covered with cocoanuts and rice fields and the villages are embowered in groves of betel-nut palms and talipots. Cassia, pepper and cardamoms flourish wild in the jungles, and form staple products for export. The fact that the pepper is cultivated without the screens used in other parts of India to preserve the humid atmosphere about it is the best proof of the dampness and equability of the climate. The low valleys are richly clothed with rice fields, and the hill sides with millet and other dry crops, whilst the gorges and slopes of the mountains are covered with dense and luxuriant forest". * But vegetation receives a severe check in the dry months, especially in the tracts over which the hot land winds blow unimpeded through the Palghat gap, when all grasses and shrubs wither away and dry, and the grounds assume a parched up appearance. The climate, particularly in the wet season, has also the effect of damaging all kinds of property that are liable to be spoilt by excessive moisture. During the monsoon months, if particular care is not taken, iron and steel get rusty, articles made of leather, woollen articles of clothing, silks, etc. get spotted or mildewed or damaged by insects, dry rot gets into wood work exposed to sun and rain, and even glazed writing paper becomes damp.

GEOLOGY.

The State has never been geologically surveyed, and it is not therefore possible to give here any detailed account of its geological formation. † Dr. W. King of the Geological Survey of India devoted a season's work in 1880—81 to a general examination of the geology of a portion of Travancore, and in his " General Sketch " he has embodied the results of his observations gathered in visits to Cochin and Malabar, which have, he says, enabled him to " generalise as to the lie and character of the very few rock formations over the country far to the northward" of the scene of his immediate explorations in Travancore. The following extracts from his sketch are therefore quoted here as the only authoritative pronouncement on the subject as yet available.

" The Travancore State, though it has long had a very irregular eastern frontier, has now been settled as lying practically to the westward of the main water-shed of the southern portion of the great mountainous

* *Climate and Weather of India, etc.*, by H. F. Blandford, p. 168.

† Since this was sent to the press, the services of a specialist have been entertained by the Darbar to conduct the geological survey of the State.

backbone or midrib of Southern India, which stretches from the low-lying gap of Palghat, below the Nilgiris, to within some fifteen miles of Cape Comorin. * * *

"In the northern part of the country the mountain mass is very broad, but just south of the Peermad parallel (the northern limit of my proper work) the hilly backbone narrows considerably and becomes a lengthened series of more or less parallel ridges with lower and lower intermediate valleys. These are striking with the gneiss, or about west-north-west and east-south-east, there being at the same time a line of higher masses and peaks culminating the main ridge, from which the ribs run away, as indicated, to the low country.

"The mountain land does not, as may be seen by any good map, run down the middle of the peninsula, but keeps to the westward; so that there is a broad stretch of low country on the Madura and Tinnevelly side, while that of Travancore is narrow. Then the mountains drop rather suddenly to the east, while they send long spurs down to within a comparatively short distance of the western coast. There is thus still, in Madura and Tinnevelly, a southerly prolongation of the wide plains of the Carnatic, which stretch round by Cape Comorin and join the narrower, though rather more elevated, low country of Travancore, Cochin and Malabar.

"This narrower and somewhat higher land of the west coast presents also unmistakable traces of a plateau or terraced character which is best displayed about Trivandrum, and northwards past Cochin into the Malabar country. South of Trivandrum these marks gradually disappear, the last trace being in the flat upland or plateau bordering the sea-shore at Kolachel. * *

"Northwards from Trivandrum there are narrow strips of absolutely low land, that is on the sea level, marked by sandy and alluvial flats and long back-waters or lagoons. These widen out northwards from Quilon, until at Alleppey (Aulapolay) there is a width of about twelve miles of such formations, with the very extensive back-water which stretches far past Cochin.

"The rock formations are—first, and most prevalent and foundational, the gneiss series; and then on it, but only in a very small way, the *Quilon beds*, which are supposed to be of eocene age. These last are overlapped by the *Warkilli beds*, which certainly appear to belong to a different series, and are thus perhaps of upper tertiary age; they appear also to be equivalent to the Cuddalore sandstones of the Coromandel. Finally, there are the recent deposits.

"The gneisses are generally of the massive grey section of the series, that is, they are nearest to the rocks of the Nilgiris, though they differ from them in being coarse-grained or more largely crystallized, and in being generally quartzose rocks.

"So quartzose are they, that there are, locally, frequent thin beds of nearly pure quartz rock which are at times very like reefs of vein-quartz. Often these beds are strongly felspathic, the felspar occurring among the quartz in distinguishable grains, or larger crystalline masses, giving the rock rather a granitic appearance. The only other region where I know

of somewhat similar beds of quartz rock occurring with other gneisses is in the schistose region of the Nellore District. There, however, the quartz rock becomes often a fine, compact quartzite; here, in Travancore, there are no approaches to such compact forms.

"The common gneisses are felspathic quartzose varieties of white or grey colors, very largely charged with garnets. A particular form of them is an exceedingly tough, but largely crystallized, dark-grey or greenish felspathic rock.

"Massive hornblendic gneisses are not common. Indeed, hornblende may be said to be a comparatively rare constituent of the Travancore gneisses.

"All the gneisses are more or less charged with titaniferous iron in minute grains; they are likewise—only more visibly—as a rule, highly garnetiferous. In fact, one might say that Travancore is essentially a country of garnetiferous gneisses. The garnets themselves are only locally obtainable, it being impossible to break them from the living rock while they are generally decomposed or weathered. They are generally of small size, but are very rich in color, the precious garnet being very common. Other minerals, such as red, blue, and yellow sapphire and jacinth, are found among the garnet sands so common on the sea-shore at certain places. The sea-sands are also full of titaniferous iron grain. * *

"The general lie of the gneisses is in two or three parallel folds striking west-north-west to east-south-east. There is, perhaps, rather a tendency of the strike more to the northward in the broad part of the hills, about Peermad, and on towards the Cochin territory. * *

"The great feature about the gneisses in Travancore, and indeed also in Cochin and Malabar, is their extraordinary tendency to weather or decompose, generally into white, yellow, or reddish felspathic clayey rocks, which, in many places and often very extensively, ultimately become what is here always called *laterite*. The evidences of these are, after all, only well seen in the field, but it may be stated here that these are seen principally in the constituent minerals, mainly the quarts, being still identifiable in much of the rock; in the lamination or foliation being also traceable; in the gradual change from the massive living rock to the soft and finally hard, scabrous, and vermicular ferruginous clayey resultant called laterite; and in the thin, pale, and poorly ferruginous forms exhibited by the weathering and alteration of the more felspathic and quartzose gneisses.

"This altered form of the weathered gneiss occurs over a definite area which I have laid down approximately in the map. At the same time, the change from unweathered gneiss to this belt is not sharp; for long before the eastern limit of the more generally lateritized belt is reached, approaching it from the mountain zone, the great change has begun.

"Very soon after one begins to leave the higher ribs of the mountains and to enter on the first long slopes leading down to the low country, the gneiss begins to be weathered for some depth into a clayey rock, generally of pale colors, streaked and veined with ferruginous matter, and having always an appreciable upper surface of scabrous or pisolitic brown iron clay, which is, of course, probably largely the result of ferruginous

wash, and, less so, of ferruginous infiltration. Also the ferruginous and lateritoid character is devolved to a certain extent according to the composition of the gneisses; but, on the whole, there is no doubt that the upper surface generally over large areas is lateritized to a certain depth irrespective of the varying constitution of the strata.

"Then, as the rocks are followed or crossed westward, the alteration becomes more frequent, decided and deeper seated; though still, all over the field, ridges, humps and bosses of the living rock rise up from the surrounding more or less decomposed low-lying rock areas.

"This generally irregular and fitfully altered condition of the gneisses begins at an elevation of about 400 feet above the sea, and thus it extends as a sort of fringe of varying width along the lower slopes of the mountains.

"At a yet lower level, say from two hundred to one hundred and fifty feet, and so nearer the sea coast, there is a better defined belt of more decidedly lateritized form of weathered gneiss, in which the unaltered rock occurs less frequently, and then always in more or less flatly rounded humps and masses, which never rise above a general dead level. This belt is, in fact, a country of undulating downs (where free from thick and lofty jungle), or tolerably uniform level stretches of forest land. Occasionally it also shows a plateau surface, or it is broken into small and low flat-topped hills. Always it is very deeply indented by river and stream valleys, or even by some of the back-waters which have high and steep shores.

"Further northwards the plateau character of the lateritic gneiss belt is very well developed in Malabar.

"It is remarkable of this coastal belt of country that its laterite (an altered, or ferruginously infiltrated condition of weathered or decomposed gneiss) is not to be distinguished from any other laterite, except that which is made of obviously detrital material." *

Laterite.

The chief building material in the State is laterite, which occurs in all parts of it except the low, sandy plains and the isolated portion of the Chittur Taluk. As it is soft and yielding in the mass before exposure to the atmosphere, it is easily quarried; when it is exposed to the action of the weather, it hardens and becomes suitable for the construction of buildings, bridges, etc. But it is not so durable as bricks and other materials which are in use elsewhere. There are two varieties of laterite, vesicular and pellety. "The former is a ferruginous hardened clay permeated by numerous vesicular branching and anastomosing tubes half an inch or less in diameter. Where the laterite has not been exposed to the air, the tubes are filled with a whitish yellow clay containing a smaller percentage of iron and a greater percentage

* *General Sketch of the Geology of the Travancore State*—Records of the Geological Survey of India, Vol. XV.

CHAPTER I. GEOLOGY.

of potash than the walls of the tubes. The deeper one digs, and the less affected the laterite is by the weather, the fainter becomes the distinction between the walls and their contents. Finally it disappears altogether, and what is laterite above is clay below. The pellety variety is more solid, and consists of small irregular nodules of red oxide of iron cemented together by similar material. It is a more advanced stage of laterite induced by exposure to the elements, and the process of its formation may be seen going on in many places. The contents of the tubes are washed out by the rains, and the exposed parts of the vesicular laterite break up. The tube walls disintegrate into little sub-angular, irregular pieces, and washed down by rain and rivers are deposited in lower levels". *

Minerals.

The mineral productions of the State are few, and are at present of no economic value. Gold is found in the sands of the river and the sea near Cranganur, and used to be laboriously sifted in the old days. This industry was at no time a very paying concern, and was given up more than a century ago. Iron used to be worked in the Talapilli and Chittur Taluks, but the influx of cheaper English material killed the native industry more than half a century ago. The ruins of several old furnaces for obtaining iron from laterite were visible in these Taluks till recently. From the account of their geological formation it is evident that iron exists in the laterite regions in large quantities, but in the absence of coal it will probably not pay to work it.

FLORA.

The flora of the State are rich in variety and luxuriance, but they have not yet been systematically studied. † Some account of the timber trees and other wild flora is given in Chapter V, and the ordinary cultivated products, including trees grown primarily for fruit, in Chapter IV. Only the more important trees characteristic of the plains will be noticed here. The most numerous as well as the most noticeable tree in the sandy plains along the sea and the back-waters is the cocoanut palm (*Cocos nucifera*), but most of the trees growing in the laterite plains are also seen there, but not in abundance. In the latter, mango (*Mangifera Indica*) and jack (*Artocarpus integrifolia*)

---

* *Malabar District Gazetteer*, Vol. I, p. 14.

† *Hortus Malabaricus*, compiled by a Dutch Governor of Cochin, Baron Van Rheede, and his collaborator Matthaeus, a Carmalite monk, with the assistance of three native physicians, and published in twelve volumes at Amsterdam between 1686 and 1704 with nearly 800 copper plate engravings, describes most of the trees and plants on the west coast; but the list yet remains to be classified by a modern expert.

are abundant, but grafted mango trees are exotics of recent growth. The peepal tree (*Ficus religiosa*) and champaka (*Michelia champaca*) trees are generally found in the vicinity of Hindu temples, while the banyan (*Ficus bengalensis*) is largely seen planted in the avenues along with jack, mango, cashew nut (*Anacardium occidentale*), nux vomica (*Strychnos nux vomica*) and ungu (*Pogamia glabra*), the gold mohur (*Poinciana regia*), and neem (*Melia azadirachta*). Among other trees growing in the plains are the silk-cotton (*Eriodendron anfractuosum*), the portia (*Thespesia populnea*), the casuarina (*Casuarina equisitifolia*), the tamarind (*Tamarindus indica*), the drumstick (*Moringa pterygosperma*), the bread fruit (*Artocarpus incisifolia*), the nutmeg (*Myristica fragrans*), the Malay apple (*Eugenia malaccensis*), the rose apple (*Eugenia jambos*), and the bamboo (*Bambusa arundinacea*). The chief palms to be found, besides the co-oanut, are the areca or betel-nut palm (*Areca catechu*), which is grown in all parts of the State, the bastard sago (*Caryota urens*), the talipot (*Corypha umbraculifera*), which is grown only in the northern Taluks, and the palmyra palm (*Borassus flabellifer*) grown mainly in east Talapilli and Chittur. The plantain is grown in almost all the compounds attached to dwelling houses, while the banana, which requires to be heavily watered and manured, is grown in patches by the side of paddy fields and on river banks. In the gardens are also grown in large quantities cucumbers, pumpkins, caladiums, yams, and other vegetables and edible roots.

FAUNA.

Big game.

The forests of Cochin contain all the larger animals of Southern India, but the advance of cultivation, the exploitation of the forests and the enterprise of *shikaris* have during the past fifty years not only considerably reduced their number, but have also driven them to the sholas of the higher ranges. Elephants and bison still roam in herds in the interior parts of all the forests to the south of the Trichur-Vaniyampara road, and the latter in the less frequented parts of Paravattani and Machad as well. The capture of elephants in pits every year accounts to some extent for their decimation, while of all big game the bison has suffered most by over-shooting. Tigers and bears are found in most places, but are seldom bagged by the sportsman. Cheetahs and leopards generally lurk in the confines of the forests, prowl into the neighbouring farmsteads at night and prey upon the ryots' cattle. The ibex or Nilgiri goat is occasionally seen in the higher ranges, while the true hunting leopard and wolf are said to be found in some of the jungles.

Small game.

Small game is still abundant in all the forests notwithstanding the havoc committed by native *shikaris*. The sambur, the

CHAPTER I. FAUNA.

spotted deer and the antelope do considerable damage to the cultivator by feeding upon his crops, but the wild pigs are his worst enemies. They haunt the confines of the jungles and do untold mischief not only in the paddy fields but also in the gardens where edible roots are grown. In the work of destroying roots in gardens, porcupines also play a conspicuous part. Jungle squirrels and monkeys of different kinds abound in every jungle, while wild dogs are met with occasionally in some parts.

Domestic animals.

The indigenous breed of cattle is weak and stunted in growth, and has of late been steadily deteriorating. The cows are bad milkers and the bulls too weak for heavy draught. The ryots have absolutely no idea of selection in breeding, and bestow little care on feeding cattle. Fodder crops are nowhere raised, and the cattle are fed during the hot weather almost entirely on paddy straw. These circumstances, together with the damp climate and heavy rainfall, make for their deterioration. Good draught bullocks found in the State are imported from Coimbatore and Mysore, and milch cows are occasionally imported from Coimbatore and Nellore. All the heavy work in the field is now done by buffaloes, the climate of this coast being not unsuited to them, and they also supply the major portion of the milk consumed in the northern half of the State. Sheep of the Semmeri breed are imported from Coimbatore, but their rearing is almost confined to the Chittur Taluk. A fairly good variety of goats is bred in most parts, chiefly by Muhammadans. Some of them are good milkers, and their milk is much in demand for the use of children and invalids. Pigs are reared in large numbers in Kunnamkulam and other Christian centres.

Birds.

Game birds and birds of brilliant plumage are abundant throughout the State. Swamps and paddy flats teem with snipe, and avenue and other trees in rural parts with grey pigeons and to a less extent, with green ones, while imperial pigeons are found chiefly in the forests. The common pigeons or blue rocks are plentiful in temples and mosques and in the dwellings of the richer classes. Teal, duck and curlew are found generally along the back-waters, and quail, jungle fowl and peafowl in the jungles. Among the gorgeously clad birds are the peacock (very rare in Cochin), different species of parrot, the sun bird, the mango bird, the common and white-breasted kingfisher, the magpie-robin, the crimson-breasted barbet and the yellow-browed bulbul. The brahminy and the common kite, the crested hawk eagle, the shikra and the little spotted owlets are the chief birds of prey, the last appearing only at night. The crow is the most ubiquitous of our birds, while the myna,

a splendid mimic, is a rarer bird. Other noticeable birds are the fish eagle, the woodpecker, the shrike, the hornbill, the spoonbill, the fly-catcher, the Malabar blue thrush, the water-cock, and the lapwing. Gorgeous butterflies of endless varieties are to be met with everywhere, more especially in swamps and jungles.

Reptiles.

Snakes are very common, except in the sandy tracts along the sea and the back-water, where they are scarce. About sixty species are represented here, but of those found in the low country, only three are said to be really poisonous, namely, the cobra (*Naia tripudians*), whose hood proclaims its deadly quality, the Russel's viper (*Vipera russellii*), whose body is thick and head broad, covered with little scales and a chain pattern down the centre of its back, and the krait (*Bungarus cæruleus*), bluish black above, with narrow transverse white streaks or spots. On the hills and at their foot are found a few more poisonous varieties, of which the chief is the hamadryad (*Naia bungarus*), which is hooded like the cobra. The back-waters, rivers and lakes are infested with crocodiles, some of which attain to large size, while smaller ones are found in most of the tanks and reservoirs constructed for the purpose of bathing and irrigation. Several species of turtles, frogs and lizards are also to be found in large numbers.

Fish.

The Cochin waters abound in fish of various kinds. The sea along the entire coast furnishes a fertile field for exploitation, the sardine being the fish that gives plenty to the local fishermen. The mackerel during the shoaling season is baled out in thousands, and in its wake follow the shark, the ray and the scienins. The mullet Nair-fish, the seir fish and the argus are also found and caught in large numbers. Among other fishes that find favour with the people are the pomflet, the sole and the whiting. The back-waters team with fish life, the most economic of them being the prawn, which is held in high esteem both in local and in foreign markets, especially the Burmese. Thousands of tons of prawns are exported annually. The back-waters abound in oysters, and excellent oyster beds are scattered over the place. The fresh water lakes, rivers and reservoirs are well stocked with many kinds of beautifully coloured fishes, the murrel and the Carnatic carp being the most abundant. The mahseer are found in the higher reaches of the rivers and ophiocephalids in every tank.