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SOME NOTES ON THE LAKE CHAD REGION IN BRITISH TERRITORY

F. W. H. Migeod

IN the middle of Africa, on the southern edge of the Sahara desert, is a vast plain. On this plain two rivers discharge their waters. They are the Shari from the south and the Yobe from the west. These discharged waters are Lake Chad.

Formerly other rivers also discharged in the same area ; but they are now dried up. Yet others, being smaller, have not force enough derived from their gradients to reach the lake. Their waters are scattered while yet at a distance. Still, were the lake to extend in size to no great degree, the waters of these rivers would indeed meet the lake water. The rivers that do not meet the lake are the Alau, the Yedseram, and the Albeit.

Whenever there is a good rainfall in the highlands to the south the level of the water in this vast swamp rises and spreads out on the plain in proportion to the additional quantity of water poured in. It retreats when the evaporation and absorption by the soil have overtaken the influx of water. If there is also a good rainfall in the western highlands in the same year, an exceptionally high lake is the result. This is now rare, as the river Yobe has for the last thirty years been carrying less and less water, and one big arm, the Komadugu Gana, has not carried water for, some say thirty-five years, others not since Rabeh's time, that is between 1894 and 1900. The general desiccation that is going on, and which I mention below, affects Lake Chad, therefore, in two ways : there is less rain direct into the lake, and less water by the river Yobe.

From the south side by the river Shari there is no reason to presume any reduction in the quantity of water brought down. Only the inevitable yearly fluctuations, due to variation in the rainfall in the far south, need be taken into consideration.

In Denham's drawing of Lake Chad in about 1824, the line of the water on the south-west and west comes very near the bounding line of dunes. In Tilho's map of 1906 the edge of the lake varies from about 3 to 5 miles farther out. Again, from what I observed myself and from native reports supplied to me, the shore-line as it was in April 1922 seemed to have receded on an average of yet another 3 miles. In some places it appeared to be even more, as at New Baga in the south-west corner. Actually this means very little, for it is often difficult to decide what is the water's edge.

Besides fluctuations due to the varying rainfall in far distant regions, there is further to be taken into consideration the annual variation like a tide due to evaporation and absorption. At New Baga I found it had been about a mile since last full water. The lake had reached Seyorum

Sketch-map of the south-western shore of Lake Chad to illustrate the paper by Mr. Migeod.

village in 1921, but I had to go $1\frac{3}{4}$ miles from there to the market huts. The water was still receding, and there was about 300 yards more of mud before the boats could be reached.

It can only be by continuous observation and by a record being kept with precision that any definite facts can be arrived at. The French have, I believe, an observation station on their side of the lake, but in British territory nothing has been or is being done.

The following are a few notes relating to the advance or retreat of the shore-line. In 1823, according to Denham, the water was close to Kaua and Bre. In 1851 a boat was launched by Barth's expedition near to Bre, and in 1855 Ngornu was reached by the water. When Seyorum was visited, it was on an island.

In 1871 the water came to Kukawa. Then in a year which was probably 1902, from the information supplied to me, the water reached Mongonu, having passed Ngornu. It also reached Kaua. At both Mongonu and Kaua the date supplied to me worked out at 1902, since they said twenty years ago; but I understood Ngornu to set it at thirty. Still there may have been another flood at Ngornu in 1892, for owing to Ngornu's nearer position to the lake, the close approach of the water might attract less attention than in towns farther back, and it does not follow that the flood did not reach the other towns in that year also. My informants might merely have omitted to mention it. In August 1921 the water again came quite close to Ngornu, but did not pass it. Kaua claims that two previous towns of that name were eaten up by the lake, the present town on a dune being the third built. Still this does not necessarily imply that the sites were not vacated again by the water.

Off Seyorum is an island of no great extent called Kulkine. It was, I was informed, formerly inhabited by the So, the ancient inhabitants of the country; but it is now unoccupied. At the time of my visit it was half a mile from the landing-place, but I was told it was joined to the mainland in the year 1914, which was a year of famine in the country owing to the failure of the rain. In crossing to it the depth of water I found to be about 2 feet and the bottom sand resting upon mud.

In the above record, therefore, there is no evidence of a general retreat of the water from the time of Denham's visit in 1823 until 1902. Since then it must be admitted to some extent, and this drying up coincides with the complete cessation of one arm of the river Yobe, and with the smaller carrying capacity of that river generally, a point I deal with in detail below. The reduction of the Yobe water, however, affects the southern portion of the lake much less than the northern portion, where, I understand, one lobe of the lake in French territory is now completely dry.

The theory has been put forward that there is an underground exit by which the water of Lake Chad escapes, though it is not quite clear

where it could escape to. The only depression that is possibly a trifle lower than Lake Chad lies to the north-east near Borku. The gradient, however, if it exists is very small, and with the great distance the difference of level becomes insignificant. Nevertheless, that much water is absorbed in the ground is supported by the fact of water being near the surface at a distance from the lake; for the shallow wells in all the towns surrounding Lake Chad, anyhow on the west and south-west side, at a distance of from 10 to 20 miles, no doubt receive their water from that source supplemented by local rainfall.

Under Bornu there is a big reservoir of subterranean water. To be precise, there are two layers of water. The upper one extends some distance from Lake Chad. The deeper one possibly derives its supply from the distant mountains. These I will now describe.

The bed of Lake Chad on the west side consists of about a fathom of white sand resting on mud, which no doubt extends to a considerable depth, and is itself an impervious clay bed. Outside the lake, however, the sand is wind-blown and deposited irregularly on this same mud or clay, which varies in colour from nearly black to grey. There are great expanses of this dark-coloured clay, extending many miles in places, round the southern and south-western sides of the lake; and it is bare of sand. It goes by the name of "firki." Although by origin it is a lake deposit, the lake water has ceased to cover it in the wet season owing to the shrinkage of the lake itself, but it has been continued in the same state through being submerged in rain-water during a number of weeks every year. The rain-water lies there till evaporated or absorbed, for there is practically no slope down to the lake. Under this clay deposit, which is generally about 3 feet in thickness, is a deposit of sand often if not always of a reddish colour. This may be only a few feet deep, and then comes a clay of a colour from pale grey to white and of great and unknown depth. With regard to the blackish clay, it is possible that it is of much greater thickness within the lake where the deposit is still presumably in process of formation, than it is outside where possibly it thins away in proportion as it is distant from the lake.

The surface or lake water descends and rests upon the white clay bed, and the shallow wells are dug so far. At a greater distance from the lake than its water reaches by percolation, the white clay has to be cut through to a great depth. The water may be at as much as 30 fathoms, and even a greater depth is not uncommon. The shallower water has the appearance of lying in an almost unbroken bed, but the deeper water by no means invariably does so. It is true there seem to be subterranean expanses in places, but elsewhere water may be found in one place and a few yards off there will be none at even a greater depth. In these cases it is no doubt a subterranean river or creek that has been tapped, and the second sinking has struck the bank.

In order to give some idea of how the water lies, I will give the depths

of the wells I met with along the route I followed. The months were March and April while I was in the vicinity of the lake, but the period of the year would only affect the surface wells, for I was invariably assured that the deep wells were unaffected by the season.

At Maidugari water is got from the bed of the Alau river in which there are pools, or if purer water be required a small hole will be scraped in the sand and water obtained a foot below. This is river water. Going on now the three days' journey to Dikoa, a distance of about 54 miles, on the first day water was at 7, then at 17 fathoms. The first might be Alau water filtered through, but the second is doubtful. The day after the water dropped to 37 fathoms, but a few miles beyond surface water was available at a depth of 3 or 4 feet only. At Dikoa the water is at $5\frac{1}{2}$ fathoms, and is brackish. Then 4 miles on is the Yedseram river with water in the dry season at 4 feet below the surface of the sandy bed.

In this line of about 60 miles there are, therefore, four independent sources of surface water and one deep source, the 17-fathom supply being doubtful, though probably to be reckoned as a deep source. If the ground were all sand down to the greatest depth to which a well had been sunk the surface water would rapidly descend to that level. On the contrary, it is held up by an impermeable stratum. It would therefore seem of necessity that the deeper water is of quite a different origin.

All round the border of Chad from near Ngala to the Yobe river is a ridge. In the south it is low and has breaks in it in the form of shallow runnels, all dry when I crossed them. In that region the ridge is difficult to follow; but all up the west side it is without important break, and rises to as much as 50 feet north of Kukawa. It broadens and contracts and has branches. This ridge is to outward appearance sand, but if it is examined it will be seen that its core or base is the black clay raised by a vertical lift, or perhaps it may be by lateral pressure. This rise has caught the wind-driven sand and held it. I tested it in a number of places.

Along this ridge, which the lake cannot penetrate, the flooding behind being due to local rain-water, are the principal towns of the lake region of Bornu. The wells are usually sunk in the clay at the lower edge of the sand dune, and average from about 9 fathoms on the south to about 6 fathoms on the west. Some of the wells are brackish and some quite fresh; and the clearer the water the more brackish it is. In the same town there are fresh and brackish wells in close proximity to each other. The water of the lake itself is quite sweet. Among the towns where there is this important difference in the quality of the water are Dikoa, Ngala, and Marte. At Aregi the whole of the water supply is exceedingly brackish.

I followed three different lines from the ridge running perpendicular to the lake, and this is how the water varied. Going from Marte Kura to New Baga the water at Marte was at 9 fathoms; at Tamsuwa it was at

$3\frac{1}{4}$ fathoms and brackish; at about 3 miles from New Baga it was 2 fathoms; and at New Baga itself, a bare mile from the lake the water was 3 feet down in the sand. On a second line from New Baga to Nglewa, there was water halfway at about $2\frac{1}{2}$ fathoms, and a short distance from Nglewa at 2 fathoms. On a third line towards the lake: at Mongonu water is at 6 to 7 fathoms, according to the sinking place on the dune. Then between that town and Ngornu is a well of 5 fathoms, and at Ngornu they are from 3 to 4 fathoms, the latter wells varying according as the lake approaches the town or recedes. On a fourth line towards the lake: at Kukawa water is at 9 fathoms and generally sweet; at Kaua 6 fathoms; Maikujiri 1 fathom; and at Seyorum water is got from standing pools in connection with the lake.

At Aleyiru about 10 miles north of Kukawa I was interested to find two water supplies, a surface one and a deep one. Aleyiru is on the dunes, but on the clay below sweet water can be got at one fathom only. Behind the rest-house, which is a mile to the north of the town, is another supply at the little village of Kanguri. This village is on the east side of the dune, Aleyiru being on the west. Here the water is at 11 fathoms. Again, at a place named Wololi, between Kukawa and Aleyiru, water was at 12 fathoms, and this was on the flat and on the west of the dune.

This would seem to show that the surface water on the large inland flats, which the lake water never reaches, does not succeed in descending very deep, and the lower water comes from a different source. The distance from the lake would be about 20 miles. It is therefore for experts in subterranean flows to decide whether it is the lake water that is descending at the rate of $3\frac{1}{2}$ vertical feet in the horizontal mile.

As to the age of this ridge, which makes so effective a barrier to the spread of the lake water into the interior of the country, its origin is possibly to be put down to the pressure or weight of the mass of lake water exercised at some distance inside the lake, and still in operation. That the ridge is ancient is clear from the fact that argillaceous ironstone exists in it. I found this ironstone between Mongonu and Ngornu and also at Kukawa, and it is worked on a large scale, supplying all the local region with iron, I am informed.

The blackish or dark grey clay, which is the surface stratum over so many hundreds of square miles, is spread on both sides of the ridge, and also under it. Possibly it was deposited in far ancient times by the lake when its limit was the ridge of sand on which Maidugari now stands. This secondary ridge, which is cut by the Alau river at Maidugari, has small gravel on it at a high level, and some of the lower sand in it is reddish. This ridge comes from the east to where Maidugari is, then turns north-west, and I am informed continues in a northerly direction. Though of great importance in a flat country like Bornu, its height is actually so slight that it is not marked in maps which indicate altitudes. Nevertheless it represents the ancient boundary of a far larger Lake Chad

than the present lake ; and I believe I am right in saying that all the blackish clay I have referred to lies within its circumference.

Nevertheless this clay, although undoubtedly produced originally as a lake deposit, has continued in its early state through annual rainfall floodings, the water lying on it for at least three months. Possibly for a vast period of time there has been no tendency for the ground either to rise or fall. This applies all the more to the areas within the range of such streams as the Alau and Yedseram, which do not reach the lake but spread their waters out on the plain while still short of it. Similar mud flats extend a long way up the river Yobe. They are seen as far as Damasak, some 70 miles from the mouth of that river by road. Higher than Damasak the dark colour of the clay is not maintained, and it becomes more and more bleached.

These two lake boundaries no doubt both date from recent times, geologically speaking. If now the subterranean strata be examined, yet a third lake limit is indicated, of much larger extent, and which must have had a vastly longer existence than the two succeeding lakes which have occupied smaller areas.

The surface stratum, as I have already said, consists of a few feet of clay, dark grey to blackish in colour. On this there are in places sand-dunes or a thin layer of wind-driven sand just lightly covering it, where incidentally grow acacia trees, and where corn and cotton and other crops are planted. On the black clay nothing is grown but a dry-season corn called Maskwa (*Andropogon cernuum*). Below this clay is a bed of sand, which in many places is reddish. This lower bed of sand is, so far as can be judged from wells and other excavations, only about a fathom deep. Below it lies a clay of a light grey colour, which becomes nearly white on exposure, and can be used as a whitewash for walls. Its depth is not known, for the wells only penetrate so far as is necessary to reach the water-bearing level within it, and I did not meet a well that had passed through and beyond it.

If this deep deposit could be laid open, it would, I think I may venture to say, be found to contain buried rocky ridges and peaks of granite rock, both grey and red, such as one meets lower down on the road from Yola on the Benue river and before one debouches on the Bornu plain. On leaving the mountains to the south the outcrops become lower and lower until they disappear into the ground, which thenceforward is destitute of rock or stone of any kind.

At Kukawa this clay, where it was used in part to build the old outer walls of the city, is a mass of small shells. I could distinguish two species only, one a long spiral, and the other a bivalve with the halves fairly capacious. The former average three-fourths of an inch in length, the latter half an inch. Both of these shells I saw also in fair quantities on the sand close to the lake. In the clay of the region south of Maidugari, however, I did not notice them ; but this may have been due to the only

clay seen by me being that which had been brought to the surface in digging wells, so it was not in great quantities. Had the shells been as plentiful as in the clay at Kukawa I do not think I could have failed to see them. Wherever this whitish clay is found, therefore, there must some part of Lake Chad have extended at some remote period of time.*

A great deal has been written to prove an ancient connection between Lake Chad and the Nile; but Tilho's surveys of the intermediate ground have shown clearly the impossibility of such a connection within, geologically speaking, modern times. What there was in the earliest ages of the world, when all the land masses were different, is another matter. The papyrus reed, which is one of the plants on which connection with the Nile is based, is common in the Congo basin; and the headwaters of the Shari river are not remote from the northern tributaries of the Congo. Further, Lake Chad is almost in water communication with the Benue river. In a very wet season I believe the water communication is actually complete by way of the Logone swamps. It would only require a very slight change of level of that land area for all the Logone water to be turned into the Benue, and possibly the waters of the Shari also. In such a case there would be no Lake Chad. With the headwaters of the affluents of Lake Chad reaching almost to the headwaters of the tributaries of the Congo, and also approaching those of the Nile, though many be now dry, a common distribution of vegetation, shells, and fish is not difficult to effect.

Desiccation.

That there is a zone of desiccation advancing south from the Sahara desert into the fertile belt is obvious. I think that there will not be found a single native agriculturist in the immediately threatened area who will deny it. Yet I believe there are a few European writers who assert that it is impossible, and that even the fertile belt is encroaching on the Sahara. I found the increasing dryness complained of while I was still far south of Bornu, and the general result of my observations is that the danger is well founded, and the most alarming feature about it is the appalling rapidity of its advance.

Mr. E. Bovill's article on the "Encroachment of the Sahara on the Sudan," which appeared in the African Society's *Journal*, 1921, is a most valuable compilation of facts on this subject, chiefly in regard to Nigeria.

* The two clays have been examined by Dr. G. T. Prior, F.R.S., of the British Museum (Natural History). He says, "The white consists mainly of small quartz grains with very little argillaceous material. The black has more clay, but also contains quartz grains. The black colour is due to organic matter, as it disappears on ignition."

I had assumed that the white clay near the lake was the same as that which I had obtained near Maidugari, but after examination of a minute portion adhering to some shells, Dr. Prior reports, "It is somewhat similar to the former, but contains rather more argillaceous material with the quartz grains. A few diatoms are present which do not appear in the other." This specimen was from Kukawa.—F. M.

I am not, however, concerned with going over his ground again, but with stating the result of my own observations and deductions within the area I passed through.

Judging by the answers to my inquiries, for the last three-quarters of a century at the very least, that is since Barth's time, there has been a steady growth of the desiccated area. The desiccation has indeed been going on from Roman times, and undoubtedly from yet earlier times. Whether there have been periods of acceleration or retardation cannot now be ascertained in regard to past centuries. What is fairly sure is that the acceleration has been recently very great. "This began in Rabeh's time," that is between 1894 and 1900, is the dating of the commencement of a dry period by the inhabitants of places where I made particular inquiries. If acceleration and retardation be denied, and a uniform advance be insisted on, then the general advance has been of a truly appalling swiftness.

It is the Sahara desert moving south. It may be held up for a time, but a temporary increase of rainfall, such as there may be in a single rainy season, can do little to resist its progress, when a previous dry year has completely destroyed the vegetation. Nature cannot recuperate itself so rapidly, and with a succeeding failure of the rain the advance goes on yet more swiftly. Two dry years do damage that a dozen wet years cannot restore.

A glance at the map of Africa will show that Lake Chad stands out like a salient into the dry zone. It forms an ample protection to the fertile land behind it, which has some of the best corn-growing properties of any land in the world. The corn, Maskwa, needs no rain. It is planted out in the vast "firki" swamps as soon as the accumulated rain-water has subsided, and the corn grows rapidly without the further help of a rainfall. All this fertile land depends on the protection of Lake Chad, and Lake Chad depends on its receiving a sufficiency of water from its tributaries, the Shari first, and the Yobe secondly.

The greater part of the basin of the Yobe falls within the limits of the area subject to rapid desiccation, and as this goes on it may be reckoned that with an ever-decreasing period of weeks in the year for pouring water into Lake Chad, the time will come when, like the Bahr el Ghazal, it will cease to pour in any at all. Hence there will be a greatly reduced lake, the area of which will depend solely on the water brought down by the Shari river. Owing to the sources of the Shari being at a safe distance to the southward, this could continue even after desert conditions had established themselves all round the lake. As the process continued the Shari would recede up its own course.

There are five ways of testing the advance of desiccation: (1) rivers drying up; (2) ponds and swamps drying up; (3) depth of wells and their abandonment; (4) nature of the forest trees; (5) southerly movement of the agricultural population, their place being taken by pastoral people.

Of the completely dried-up streams which used to flow into Lake Chad, the Bahr el Ghazal has been the one that has caused the greatest controversy. The point that has been most discussed is whether it was an affluent or an effluent. In venturing into the discussion I can only do so on the grounds of having seen what I consider an analogous case elsewhere, and the view I take is that remotely it was an affluent and later became a partial effluent.

It was by origin an affluent at the time when the mountains of Borku to the north-east were timbered and fertile, and a collecting area for water. This was probably before the historical period in Africa. As the desiccation of this hill region advanced, so the water in the Bahr el Ghazal would decrease. At that same period there would have been more water in Lake Chad than at the present day, and its area would have been greater in proportion, since the other rivers then also flowing in that more humid age would all have helped to bring in more water to the central depression. The annual rise and fall of the lake would also possibly have been greater than now ; but in this connection it must not be overlooked that the rise due to the southern rivers would not coincide with the rise due to the northern affluents. They would neutralize each other as is the case on the Congo river, where there are two high and two low waters in each year. Still, in the case of Lake Chad the neutralization would have been to a much smaller extent, for the southern supply of water was assuredly in excess of what the Bahr el Ghazal and a few other smaller affluents could bring in. This excess of southern water, coming at the season when the Bahr el Ghazal would be lowest, would cause a banking up of the lake water into the lower part of the channel of the Bahr el Ghazal.

A similar thing can be seen at the present day at the confluence of the Benue with the Niger. I observed it personally in 1898 and 1899. The Benue, drawing its water principally from the south, and its sources being nearer the confluence than the sources of the Niger, begins to rise first at the confluence, and in the month of May banks up the Niger even to the extent of making a reverse current for a few days until the Niger rise makes itself perceptible. If the Niger were beginning to dry up, and the water coming down to be appreciably less, which is indeed the case, the increasing influence of the Benue, which every year would advance yet a little farther up the Niger's course, would be to make an increasing deposit of silt and raise the bed of the Niger near the confluence.

This is apparently what has occurred at the lower part of the Bahr el Ghazal. The annual rises of water of Lake Chad have raised the level of that river's bed for some distance from the mouth, and the process has continued until now the bed of the river within the reach of the lake is higher than that portion which the lake water has never attained to. It thus comes about that the present appearance of the lower part of the river is that of an outlet.

Now as to the river Yobe: I travelled close to this stream for the greater part of its course. At the end of April 1922, when I was at Yo near its mouth, there was no water flowing, but the sand had only to be scraped for the water to be found close to the surface. The width of the river at Yo is about 40 yards, and it runs between banks of sand. At Katagum and Hadeija, each on a separate tributary or branch, some 250 miles up by road but possibly over twice as far if the river itself be followed, the two affluents which join some miles below are both larger than the river at its mouth. There is no material change of latitude. It must therefore be assumed that there is a great loss of water on the way down to the mouth. Another feature is that although at these two points, Katagum and Hadeija, on the upper rivers, the water was not flowing in May, nor was it flowing at its mouth, yet at Gaidam about halfway down was continuous water, the deep pools being connected with flowing water. This may be accounted for by a change in the gradient for a short distance, for at a couple of miles below Gaidam it ceased, and a day's march higher up the big pools in the river-bed were unconnected at the surface.

Between Yo and Gaidam a feature of the river Yobe is the large number of lagoons alongside it containing standing water when the river itself is empty. They are all narrow, and some are miles long. They seem to be abandoned sections of the river, the stream having made a new channel. In flood-time they are connected with the river, and they then obtain their supply of water which lasts all through the dry season, and makes pleasant oases of them with green pasture for the flocks and herds. That they were once filled with running water is borne out by the high scarped bank one sees alternately on either side, and by their windings, where now there is no running water. They have been long separated from the main river in all probability, for no local person I met had any remembrance of any of them ever being part of the main stream, nor any tradition of the fact.

I have already mentioned the Komadugu Gana, from the south, which has not flowed in its lower course nor joined the Yobe for a quarter of a century; and the northern affluents have not flowed since time immemorial.

Turning now to lakes and ponds other than those close to the Yobe, one hears of many that have dried up completely and are now strewn with the bones of dead hippopotami. Barely two days north of Gaidam there are depressions where salt is now made. Less than twenty years ago they were pleasant lakes, and the older inhabitants remember when there were hippopotami in them.

With regard to wells drying up, I have read of this being so in some places, but not a single case came to my personal notice, nor did I hear of any from native sources. The abandonment of a well when I did meet with such a case seemed always due to the sides having fallen in, or in the case of a surface well to its having been defiled. In the latter case

no doubt it might later when needed be cleansed. I formed the opinion of the very deep wells that they are independent of local climatic conditions. Whenever I inquired as to whether a particular well had more water in it after the rainy season, I was always informed it made no difference, but I gathered that all wells after a few months' disuse in the rainy season, when there was surface water available, invariably required cleaning before coming into use again.

Then with regard to forest growth, though in other parts of Africa I have seen the eating up of the forest and its place being taken by vegetation of different species more suited to the new conditions, I observed none of this on my route. It is true I frequently came across belts or for the most part patches of forest growth of a totally different nature from the surrounding vegetation. They might stand out as islands, but there was nothing to indicate that their presence was due to changed climatic conditions. It seemed rather due to difference of soil.

In a number of places, however, near the river Yobe, I saw hundreds of dead trees, many of large size, standing in what had been swamp land, while trees around, equally species of acacia, had survived. The reason of their survival was that they grew on sandy soil slightly raised above the swamp. It might be supposed that the trees in the swamp land would have survived the process of desiccation longer than the trees growing on sand. What, however, had occurred was that in a certain year the swamp had failed to receive its customary supply of water which alone would ensure complete saturation. In the ensuing dry season the mud became so hard that the rootlets of the trees were unable to function, whereas those in lighter soil, though subject to an equal shortage of water, nevertheless managed to retain some vestige of life till the rain came again.

It is, I might add, not only by rain or underground water that the trees in these semi-desert regions live. As soon as the south-west wind is felt in the month of May, and the dry parching desert wind ceases for an increasing number of hours in the day, then the trees begin to sprout, and have put on their leaves long before the rain comes. It seemed to me also that the trees in swamp land yielded much later in many cases to the reviving influence of the moist winds, due no doubt to the excessive hardness of the mud they grow in.

I do not propose here to go into the question of tribal movements started by desiccation of the land, but would merely state that whenever a movement takes place, and a new village is founded, it is always to the south of its predecessor. I found one exception in the case of a village which had been a few miles south of the river Yobe. It had moved north to a new site nearer the river, which is of course intelligible, and still confirms the theory of desiccation.

If we take the capitals of the Bornu empire dating from six centuries back, each successive capital has been south of its predecessor. The

inhabitants of Bornu proper do not go to Kanem on the north side of Lake Chad in order to settle there. On the contrary the Kanembu have moved south, and occupy most of the towns in whole or in part as far to the southward as Ngornu. Further, the Margi, who used to extend as far north as Maidugari, the present capital of Bornu, are now only met with three or four days to the southward.

All the evidence is that the trend of migration, not only along the Lake edge, but farther west also, is in general in a southerly direction. No community goes in a northerly direction, but many movements have followed the course of the Yobe river, which gives them a westerly direction with only a slight degree of southing, since that river has held them to the fertile lands along its course.

DARFUR

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DARFUR, or the country of the Furs, was formerly one of a chain of ancient kingdoms which stretched across the African continent from east to west, and of which Abyssinia alone survives to-day as an independent state. Its original inhabitants were a Negro race, who lived a primitive existence in the more mountainous parts of the country, and were ruled by a line of pagan Dagu sultans. In the sixteenth century, however, they were brought into touch with Mohammedan influence, and thereafter gradually converted to Islam. With their conversion, the sultanate passed into the hands of the arabicised Kungara branch of the Fur, and in 1596 Solong, the first Mohammedan sultan of Darfur, whose mother was an Arab, ascended the throne.

The old Dagu sultans had been content to rule a circumscribed area surrounding their mountain fastnesses, but their successors had more ambitious ideas and soon set about extending their dominion. Descending from the great Marra range, they not only conquered the wide plains adjoining it, but also overran the neighbouring province of Kordofan, and finally penetrated victoriously as far as the Nile. Their triumph was however short-lived, and the warlike Fungs soon commenced to drive them westwards whence they had come. By 1770 they had lost even the province of Kordofan, and, though they retook it a few years later, it was finally conquered from them in 1822 by Mohammed Bey Daftardar on behalf of the Egyptian Government.

After this reverse the Darfurians retired westwards, but fifty-two years later Darfur itself was annexed to Egypt by the famous Zubeir Pasha, who advanced into it from the south on the pretext that the Darfur sultan was unable to control his people and prevent them raiding into the Bahr-el-Ghazal. In 1877 General Gordon visited Darfur, where Sultan Harun