

*Memorandum on the great flood of the river Indus which reached Attok on the 10th August, 1858.—By Captain T. G. MONTGOMERIE, Bengal Engineers, F. R. G. S. 1st Asst. G. T. Survey, of India, &c.\**

“At 5 A. M. on the 10th August, 1858, the Indus at Attok was very low. At 7 A. M. it had risen 10 feet. By 0.30 P. M. it had risen 50 feet, and it continued to rise till it stood 90 feet higher than it did in the morning. The Cabul river continued to flow upwards for ten hours.”—*Extract from the proceedings of the Asiatic Society for September 1858, Journal Vol. XXVII. p. 366.*

The flood destroyed a large amount of property in British territory both above and below Attok; and the back water (on the Cabul river) destroyed the greater part of the private property in the cantonment of Naoshera.

After the subsidence of the water, numerous reports were current near Attok, viz.: that the river was still blocked up and that another similar flood might soon be expected. These reports were generally given out on the authority of the inhabitants far up the river, who had sent down word to say that the water was still dammed up.

Such a sudden flood or cataclysm on such a gigantic scale, at all times an important and interesting subject of enquiry, was rendered still more so to me by the above mentioned circumstances.

Being at the time of the flood in the territories of the Máharajah Rumbhir Singh. I was in a favorable position for making enquiries in the Upper Valley of the Indus as far as the Máharajah's territories and influence extended, and I consequently made all the enquiries that I could.

On applying to the Wazeer Punnoo, the governor of Kashmir, he told me that had any damage been done in the Máharajah's territories by a flood on the Indus, he would certainly have heard of it, but up to that time he had received no report on the subject. However I begged him to write to all the Máharajah's officials (on the

\* See papers by Capt. Henderson and Major Becher, Journal, Vol. XXVIII. pp. 199 and 219.

Indus and on its tributaries)\* to enquire whether any extraordinary flood had been noticed. The answers were all in the negative except that from Boonjee, (the Máharajah's most northerly fort and cantonment on the Gilgit frontier) the report was as follows, viz. :—

“That a great flood (burá sailab) was noticed by the sepoy<sup>s</sup> at Boonjee on the 27th day of “Sáwan Mahina,” “derh pahar din gaiya” when it first arrived. Shortly afterwards the sepoy<sup>s</sup> saw a mass of timbers floating down the stream, which they recognised as belonging to the gateway of the Númbúl fort.”

The Númbúl fort is said to have been on the Gilgit river below the point where the Naggar river joins the Gilgit river.

I understand “the 27th day of Sáwan Mahina, derh pahar din gaiya” to mean the 11th day of August about 9 or 10 in the morning. Although this is the day *after* the flood was noticed at Attok, it is in my opinion sufficiently near the date to make it highly probable that it was the same flood that was noticed at Attok.

At a frontier outpost of the Máharajah's (where no one goes that has sense enough to make interest to keep away), a mistake of two or three days in the date would be no wonderful thing considering the general indifference of natives on the subject of dates and the numerous doubts as to when their months begin.

I am therefore of opinion that the flood (sailab) noticed at Boonjee was the same that passed Attok on the 10th of August, and for reasons given hereafter I am of opinion that the sepoy<sup>s</sup>' date at Boonjee should have been the 25th of Sáwan or the 9th of August about 9 or 10 A. M.

The Trigonometrical height of Skardo the capital of Little Thibet situated on the river Indus has been ascertained to be about 7700† feet above the sea and that of the G. T. Station eighteen miles above Attok has been found to be about 1050‡ feet above the sea, thus shewing a difference of height between the two places of about 6650 feet. The distance between Skardo and the above G. T. Station by the course of the river Indus is approximately about three hundred and ten miles, and consequently there is an average fall in

\* Specially mentioning the Shayok river.

† G. T. S. point near Skardo fort 7701 very little above river.

‡ G. T. S. Station on river eighteen miles above Attok and 1049 feet above sea.

the bed of the Indus between those places of about  $21\frac{4}{5}$  feet per mile.

Similarly the height of Baramoola where the Jhelum river leaves the Kashmir valley is about 4930\* feet, that of the river† two miles below Jhelum is about 750 feet above the sea, shewing a difference in height between the two places of about 4180 feet. The distance by the course of the river Jhelum between those two places is about one hundred and ninety-four miles giving an average fall in the bed of the Jhelum of a little over  $21\frac{4}{5}$  feet per mile.

Consequently we may assume that the Indus and Jhelum rivers flow at (very nearly) the same average rate between the respective places mentioned.

With the assistance of Lieut. Melville‡ I measured the rate of the Jhelum river at Naoshera, one march below Baramoola, in as slow a part of the stream, as there is between Baramoola and Jhelum, and I found the rate to be nearly 690 feet per minute, or about seven miles per hour. And Lieut. Melville quite agreed with me that we had taken a place where the rate§ was far below the average. The river Jhelum between the points mentioned has in general such rugged and precipitous banks that it was with difficulty that even the above measurement was made.

The distance from Boonjee to Attok may be taken approximately as about two hundred and twenty miles, and if the flood in question was the one noticed at Boonjee it traversed the distance between those two places between 10 o'clock in the morning of some day before the 10th of August and say 6 A. M. of the 10th August, that is the flood must have taken either twenty-one hours or forty-five or sixty-nine &c. to traverse two hundred and twenty miles, that is, it must have passed Boonjee on 9th, 8th or 7th of August. Had the flood passed Boonjee on the 8th August, it would have taken forty-five hours and would have travelled at the rate of hardly five miles an hour, but it has been shewn above that the average rate of the

\* Baramoola Barometrical height 4938 feet above sea.

† G. T. S. point two miles below Jhelum 758 feet above sea.

‡ Topographical Asst. Great Trigonometrical Survey.

§ Seven miles an hour may be assumed to have been the minimum rate of the Jhelum river.

Indus must be above seven miles an hour in ordinary times, and of course much greater during a flood, so it may, I think, be fairly concluded that the flood would take only about twenty-one hours in traversing the two hundred and twenty miles, and that it passed Boonjee on the 9th August, 1858, about 10 A. M. If so it travelled at the rate of ten and half miles per hour, by no means an improbable rate\* as the Ganges when it issues from the hills opposite Hurdwar is stated by the Canal officers to flow in ordinary times at nine miles an hour, and its pace looks slow compared with that of the Jhelum below Baramoola.

As soon as I got the report from Boonjee I sent for further information but could only make out that the flood was understood to come from Naggar, an independent district which the Máharajah's people called a part of Yághistan! quite inaccessible to ordinary messengers. Nothing would induce a man to go there; and the Wazeer said that when a present was offered, the man took the money, but only went a short distance and returned after a time with a made-up-story.

Though repeated enquiries were made, nothing further was elicited.

Indeed beyond the fact that the flood had come from the Gilgit river, as reported by natives and as shewn by its carrying away the well known gateway of the Númbúl Fort, nothing positive was known as to the cause of the flood or of the exact site of the place dammed up, though the Boonjee sepoy's believed that it came from the Naggar valley which is drained by an Eastern tributary of the Gilgit river.

Whether the flood in question came from Naggar or not, I feel quite certain that it did not come from above Skardo. At the time of the flood two of my assistants were working round Skardo, and another was working on the Shayok river within a month afterwards. I asked them to make particular enquiries, but they heard nothing of a large flood from any of the inhabitants of those parts.

\* A table taken from the Philosophical transactions gives 480 feet in one minute or nearly five and a half miles an hour as the velocity of absolute torrents with an inclination of only 3 feet 1.27 inches per mile. The table gives no greater inclinations.

Had the flood been generated on any of the tributaries of the Shayok I must have heard of it, as the damage done by the water on first escaping from the barrier or dam would have been very great in the Shayok valley itself.

No report was prevalent at Boonjee or elsewhere in the Máharájah's territories as to any river being still dammed up or as to the prospect of another flood.

Should the river Indus or any of its tributaries be hereafter dammed up in any part of the Máharájah's territories, there would not be much difficulty in getting information from the Máharájah's officials, if proper measures were taken for collecting the same.

If timely warning were given, I think that the water might be eased off, if the place was accessible and labour was available for the necessary blasting, mining and other operations.

If, however, an obstruction should arise on the Gilgit river or any of its tributaries, there is, in the present political state of those valleys, no chance of getting timely warning or any accurate information, and if such was forthcoming, nothing could be done as to easing off the water unless the Engineer was accompanied by troops.

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*Memorandum in answer to the five following questions\* by Captain T. G. MONTGOMERIE, Bengal Engineers, F. R. G. S., 1st Asst. G. T. Survey, &c.*

1st. Whether there is any truth in a prevalent rumour that the Indus or one of its tributaries is still obstructed, and how it arose ?

2nd. When the late cataclysm of 1858 (August) occurred and how it arose ?

3rd. Whether such accidents are likely to be limited to one locality or may occur in several points of the Upper Indus and its feeders among the mountains ?

4th. Where is the probable locality of the cataclysm of 1841, and how was it occasioned ?

\* Questions proposed by Major Becher, Bengal Engrs.

5th. What means are the most available for ascertaining the occurrence of such a calamity in future?

1st. There is no report prevalent in the Máharájah's territories as to any portion of the river Indus or its tributaries being dammed up.

2nd. In my opinion the late cataclysm of August 1858 was generated in the Naggar valley on a tributary of the Gilgit river, see accompanying Memorandum on the flood of 1858.

3rd. I do not think such accidents are likely to be confined to one locality only. On the contrary, I think they may occur in a great many places both on the main Indus and on its tributaries. The main river would not, however, be likely to submit to any obstruction so long as the tributaries would.

4th. I have made enquiries about the flood or cataclysm of 1841, as far as I have heard at present I am inclined to think that it did not arise in the Shayok river. The Khapalu Rájah Mahomed Ali Khan says in a letter of July 1859, that the last great flood on the Shayok river took place about twenty-four years ago, that is in 1835, but that he was a small boy at the time and did not remember it well. His district suffered very much during the flood and had it occurred in 1841 he would have remembered all the circumstances. I have again addressed the Rájah on the subject and have asked for more precise dates.

Again I think, on examining the existing maps of the Upper Indus, that it is highly improbable that the damming up of the head of the Shayok river\* would make the Indus look smaller at Attok than it otherwise would be. Had the whole of the Shayok river been stopped, the Indus at Attok might have looked smaller than usual but not so for less than a tenth part. And this applies both to the flood of 1841 and 1858, if on the latter occasion the river really was much lower than it would have been had there been no flood—I am of opinion that if the water that falls into the Shayok above Sassar† never fell into it again, no one would ever notice the loss at Attok.

\* At a point not more than forty miles below its sources.

† The point where the cataclysm of 1841 was said by some to have been generated.

3. According to accounts of the cataclysm of 1841 the river Indus was observed to be unusually low in December 1840 and January 1841 at Attok and lower still in February and March. If that was the case it would point to the damming up of something that contributed more water than the head of the Shayok possibly could. Indeed when the channel was open but little water could descend during December and January from such a cold tract as that of the Shayok above Sassar, when snow only falls and when the melting of the glaciers must have almost ceased. Moreover the area drained by the Shayok; at Sassar is comparatively speaking insignificant.

It is a question whether it was not simply a matter of gossip as to the Indus having been unusually low\* both in 1841 and in 1858. In the *latter* case the fact is very doubtful. People on the river would naturally say "we noticed that it was very low, &c."

It would require a very careful registration of the height of the river for several years in order to come to any trustworthy conclusion as to whether the Indus was at any period lower or higher than the average.

If some sort of daily register was kept at Attok light might possibly be thrown upon any future cataclysm that may occur. Observations should be made as to the height† giving the daily maximum and minimum heights and noting the time, velocity, temperature, colour, &c. of the water with general remarks on the weather.

As to getting timely warning of the damming up of the Indus or any of its tributaries, the Lieut.-Governor of the Punjab will I have no doubt be able to get the necessary information from the Máharájah's officials if it arises in the Máharájah's territories. Should it however arise in the Gilgit river or its tributaries, there is no hope of getting any, as I have explained in my memorandum on the flood. As far as the Máharájah's territories are concerned I

\* The Indus is, I believe, generally very low in December and January.

† The height to be referred to some permanent bench mark not liable to destruction.

All the rivers in the Punjab have a tide or daily maximum and minimum height in the mountains caused by the difference between the amount of snow melted during the night and during the day.

recommend that periodical reports should be obtained from the Máharajah's officials at Boonjee, Skardo and Leh, say once a month whilst the passes are open, in order to shew that their attention is directed to the subject—special reports to be made directly any reliable information is obtained as to any obstruction in the Indus or its branches. In the winter months men without loads can in fine weather often cross from the valley of the Indus to that of Kashmir, it only requires a sufficient inducement.

The officer at Boonjee should be requested to report on the river in the neighbourhood of the fort and to get all the information that he can from the Gilgit countries, viz. Naggar, Hunza, Yassin, &c.

The officer at Skardo to report on the river in his neighbourhood\* more especially on the Shayok river and its tributaries getting information from the Khapalu Rajah and the Kardar of Nubra.

The Thanadar of Ladak to report on all the rivers in his district.

The Máharajah is at present preparing for an expedition against Gilgit and may possibly succeed next year in establishing his posts in that valley, should he do so Hunza and Naggar will most probably come under his rule and Yassin may come under his influence. In that case information might be forthcoming as to the state of all the countries drained by the Gilgit river.

Under all circumstances it is very difficult to get information on such a subject, the natives take little interest in it, and barriers formed by landslips or glaciers may arise in some of the very elevated gorges which are rarely if ever visited by men from the Ladak side.

\* Khapalu and Nubra.