

No. VI. SURVEY OF THE JHELUM RIVER.



REPORT upon the River Jhelum, with a view to its Navigation in the low season; also, remarks on the Chenab, from Trimmo Ferry to Mooltan. December 1860, and January 1861.

GENERAL CHARACTER OF THE JHELUM.

The Jhelum river, after passing the town of that name, on the right bank, flows in a general direction of S. 60 degrees W., about 50 miles, to Pind Dadun Khan, having skirted the base of the Salt range for nearly 30 miles.

2.—It continues much in the same direction to Koshab, a distance of about 45 miles, and thence more southerly (S. 9° W), 70 miles to its junction with the Chenab, close to Trimmo Ferry.

3.—The whole distance, from Jhelum to Trimmo, is 132 miles in a direct line, increased, by the windings of the river, to upwards of 200.

4.—The breadth of the stream is generally from 250 to 300 yards,—in some places as much as 700, and, in others, only 40 and 50 yards.

5.—The navigable channel is from 40 to 80 yards wide, frequently only 25 and 30 ; but when the stream is not obstructed by shoals, the channel extends from bank to bank.

6.—This, together with its many shallows and intricacies, render the Jhelum, in the low season, unnavigable by the flats and steamers at present belonging to the Indus Flotilla.

7.—The current seldom exceeds 2 miles per hour, and averages $1\frac{1}{2}$. Occasionally, after a fall of rain, it runs at the rate of 4 miles per hour, but only for a day or two, in proportion to the quantity of rain experienced.

8.—The greatest depth of the Jhelum is 21 and 22 feet, and the least 18 inches. Its more general depth is from 5 to 7 feet.

9.—The bed of the river is of soft alluvium, or a mixture of mud and fine sand, freely acted upon by the water or any other body. Except in the vicinity of Jelallpor, at the foot of the Salt range, and at Jhelum, no stones or rocks exist ; and in no case so as to impede the navigation.

10.—The banks are from 8 to 10 feet high, and are sometimes overflowed during the inundation ; a few miles below Koshab, however, 20 and 25 feet. They

are not always well defined, and at times there is difficulty in distinguishing them from the low land of the plain.

11.—Few snags are to be met with above Koshab, but in the lower part of the river they are more numerous. As a rule, they may be looked for in the vicinity of date trees, and where the banks, being well wooded, are eaten away or undermined by the river in its course. In consequence of the narrow and tortuous channels they are, to a certain extent, obstructions, and require removal.

DESCRIPTION OF THE NAVIGABLE CHANNEL, &c.

1.—After leaving Jhelum, the stream and channels are well defined for a distance of 4 miles, with a depth of from 3 to 6 feet.

2.—The river then divides into two branches, and only 18 and 20 inches water could be obtained, channel narrow and intricate; this continues for about $\frac{3}{4}$ mile, when the streams reunite, and the navigation is easy and unimpeded as far as the village of Malikpoor, 3 or 4 miles above Jelallpoor.

3.—The river here is diffused over an extensive marsh, studded with islets, and forms a perfect archipelago; with so many minor channels it is frittered away, and reduced to a width of 50 and 60 yards, and a depth of 18 and 20 inches.

4.—This continues until Jelallpoor is passed, where the channels and river assume a better appearance.

5.—Five miles below Jelallpoor, another shallow and tortuous place exists, occasioned by the river being wide, the banks 500 yards distant from each other. After a careful examination, 18 inches was the most water obtainable.

6.—The navigation then improves until Pind Dadan Khan is reached.

7.—At Pind Dadan Khan the river is about 300 yards wide, with many shoals and sand banks, but the channels are good until near Bhera—a distance of about 12 miles.

8.—At Bhera the river is much the same as at Jelallpoor, its bed being cut up into numerous islands and shoals, with marshes and shallows between them. The stream is wasted, and the channel almost destroyed, 20 and 21 inches of water were, however, discovered.

9.—From Bhera to Kōshab, there are, at distances varying from 5 to 6 miles, three places where only the same water could be obtained, the channels tortuous and from 25 to 30 yards wide. These, however, I think might be improved by damming up some of the minor ones.

10.—From Koshab to the Junction the river is generally more favorable than the upper part, above referred to; the banks are to be better traced, and the water for the most part included within them instead of meandering over flats and marshes.

11.—Twelve miles below this town there is only 2 feet of water, at intervals for a distance of nearly 2 miles; and at every 9 or 10 miles until the junction of the two rivers occurs only 2 feet can be reckoned upon.

12.—The two worst places in this section of the river are at the villages of Buqqi and Sha ki kote, at the distances of 42 and 20 miles from Trimmo respectively.

13.—These several localities and obstructions are all very similar in character, occasioned generally by the water being spread over a bed of some extent or drawn off and diverted by small streams and nullahs.

14.—I am of opinion that steamers, drawing 2 feet of water, will be able to ascend to Koshab at all seasons of the year; but from that town to Pind Dadan Khan and Jhelum, vessels of only 18 inches draught will be required.

THE CHENAB FROM TRIMMO FERRY TO MOOLTAN.

1.—From Trimmo Ferry to Mooltan, a distance of about 80 miles, S. W. by S., the Chenab is navigable all the

year round by steamers not exceeding $2\frac{1}{2}$ feet in draught.

2.—The stream and channels are wider than in the Jhelum, and the navigation of course more easy in consequence.

3.—In the month of December, 1860, the steamer "*Assyria*," drawing 3 feet 2 inches, succeeded in ascending it, and entered the Jhelum for a distance of 10 miles. In some places, everything but the engine had to be removed to reduce her draught to 2 feet 8 inches, and the vessel was hove over the shallows.

4.—The worst portion of this river was about 12 miles above Mooltan, not far from Rungpoor.

5.—The current averages $2\frac{1}{2}$ miles per hour, but this is occasionally exceeded.

O B S T R U C T I O N S, &c.,

There being many places in the Jhelum, where only 18 and 20 inches can be obtained, the channels being at the same time intricate and narrow, it is obvious that unless steamers can be so constructed as not to exceed that draught, the navigation of this river must be closed during the low season.

2.—In any case it is desirable that something, if possible, should be done to increase the scour, and thus add to the depth of water at present available.

3.—No works of a permanent and expensive character will, I think, be of any utility ; but it may be a question for the consideration of Government whether, by having an establishment somewhat similar to that employed in Bengal, the channels may not be rendered deeper and wider.

4.—That all the foul places can be improved, I am not prepared to assert ; (for instance where the river is very much cut up, as at Jellallpoor,) but in many I think that some improvement may be anticipated, and this by damming up some of the minor streams which drain off the water from the main channel. The removal of snags also is another duty to be desired.

5.—It is not probable that the shallows and intricacies which have been mentioned above will remain in the same situation for any lengthened period ; indeed it would be contrary to the general properties of an Indian river were they to do so, but it may reasonably be inferred that at every low season places of a similar description will be found at distances varying from 8 to 10 miles, and it is these occurring so frequently which will confine the navigation in that season to vessels of so reduced a draught as 18 inches.

P I L O T A G E.

The system which obtains on the Indus of having

a pilot for every 20 or 25 miles of river, works well; and any attempt at buoying the channels, as has been suggested, if practicable, are unnecessary.

2.—Steamers will run aground occasionally, and these accidents would not be lessened by laying down buoys, which by reason of the shifting nature of the channels would be more likely to mislead than to be of any real service.

FUEL STATIONS.

There is no difficulty in the low season in selecting stations for fuel, which the steamers can approach, and probably none when the river is high.

2.—Pind Dadan Khan and Jhelum both possess a good bank, and would be well adapted for head quarter stations, as might be determined on.

3.—A good bank, and means of approach to it, are, indeed, all that is required for a river steamer depôt.

GENERAL DIMENSIONS OF A PADDLE STEAMER FOR THE RIVER JHELUM.

Length,	140 to 145 feet.
Breadth of beam, ...	30 feet.
Depth of hold, ...	from 4 feet to 4 feet 6 inches.
Draught, when laden,	not to exceed 1 foot 6 inches.
Engines of 50 horse power, or sufficient to propel the vessel 11 miles an hour.	

It is essential that the above draught should not be exceeded. As this is increased the navigation will be closed for a month or two according to circumstances.

2.—Vessels built with what is termed a spoon bow, and no keel, answer well on the Indus, and should be adopted on the Jhelum.

3.—A steam capstan, in addition to the ordinary one for working the anchors, as is fitted to the “*Jhelum*,” (Indus flotilla steamer), should also be provided.

4.—With reference to the material of which the vessels should be constructed, I cannot do better than quote an extract from the report named in the margin.

“A material, technically called *homogeneous iron*, being, in fact, a species of steel, has lately been introduced, and used with considerable advantage in the construction of boilers; its strength far exceeds that of iron, and we think, that for some portions of the boats, it may be well to adopt it.”

Report of the Commission appointed by the Hon. E.I.C. to visit the rivers Danube and Rhone, with a view of obtaining a conclusive opinion upon the description of vessel adapted for the rivers in India, printed in 1858.

5.—Where such a condition as a draught of 18 inches is concerned, it would be useless to enter more particularly into the description of boat. This must be

left almost entirely to the designer and constructor of the vessel.

6.—Steamers of nearly a similar length and breadth of beam, with a greater depth of hold, are now running on the Indus ; but, so far as I am aware, there are none in India of so light a draught as will be essential on the Jhelum.

CONCLUDING REMARKS.

During the survey the river was generally stationary, and, for a few days in the latter part of January, fluctuating.

2.—It is to be regretted that at this time of the year the navigation must be restricted to vessels of the draught recommended ; but the navigable capacity of a river can only be rated according to the least depth of water, and the narrowest channels through which they must of necessity proceed.

3.—In conclusion, I would observe that native accounts mention the river as being much lower this season than it has ever been before ; and Lieut. Holt, I. N., is also of the same opinion. Indeed, it is worthy of remark, that at the present time the Government steamers are unable to ascend higher than Shere Shaely, 12 miles below their usual anchorage at Mooltan.

CHARLES FORSTER, LIEUT., I. N.
Mooltan, 11th February, 1801.