

third flight may have often been observed, they are well seen in the picture, and it may have been thought that they led from the hill down to the well or Bir Eyûb, and no further notice been taken of them.

(4) In my judgment the supply of water has much to do with the question whether this was a fuller's "plant" or not. No doubt the supply of water at the Virgin's Fountain was always limited and the demand great; but was there sufficient for the ordinary demands and for the needs of an extensive fuller's establishment besides? In Bir Eyûb the fuller had within 100 feet of his vats a supply of water that was ample and never failing.

If I wished to go into the fulling business in Jerusalem in the old style, I should not go *north* of the city, where there is no water, or *west* of the city at "Upper Gihon," where the water disappears after May, but I should go south-east of the city and buy up Bir Eyûb and the rock adjacent, clean out these old vats, and go to work. Abundance of water, rock-hewn vats, a large rock surface where cloth could be spread for drying—all grouped together.

THE DEAD SEA.

By Major-General Sir CHARLES WILSON, K.C.B., &c.

IN the last *Quarterly Statement* Mr. Gray Hill has raised an interesting question with regard to the surface level of the Dead Sea. In May last the level was higher than it has been for several years, and Mr. Gray Hill asks whether it is "possible that there is some volcanic action at work raising the bed of the lake?"

There are no traces of recent volcanic action in the vicinity of the lake, nor of any terrestrial movement of elevation or depression that would affect the level of its waters. It is, however, well known that the surface level of the lake rises and falls during the course of each year, and the difference of level has been estimated at from 6 to 15 feet. It is also probable that there are prolonged periods of high and low level following a succession of wet and dry years. The phenomena noticed by Mr. Gray Hill are apparently due to the excessive rainfall of the last 10 years.

Meteorological observations have been taken at Jerusalem since 1861, and the rainfall for 32 years (1861-92) has been tabulated by Mr. Glaisher in the *Quarterly Statement* for 1894. The results for the seven years, 1893-99, have been published in later volumes. The figures in the tables are for the whole year, January to December, and not for the rainy season, November to April, but they are sufficient for the present purpose. The lowest rainfall, 13.39 inches, was in 1870, the highest, 41.62 inches, in 1897. The average of the 32 years, 1861-92, was 25.23 inches; for the seven years, 1893-99, 29.92 inches; and for the last 10 years, 1890-99, 31.09 inches, or 5.86 inches above the 32-year average. June, July, August, and September are practically rainless months; the average for May is 0.27 inch, and for October 0.41 inch. The wet months are January, average 6.38 inches, December 5.50 inches, February 5.06 inches, March 3.56 inches, November 2.29 inches, April 1.71 inches. From the above it would appear that the three months during which the rain is heaviest are December, January, and February; that there has been an excessive rainfall during the last 10 years, and that the rainfall of 1897 was exceptionally large.

The rainfall of the Jordan Valley is much less than that of the hill-country to the east and west; but the Jerusalem statistics give a fair indication of wet and dry years in the Jordan-Dead Sea catchment basin, and of the relative amount of water which must find its way each year to the Dead Sea. When the great extent of the catchment basin (between 17,000 and 18,000 square miles) and the limited extent of the Dead Sea (about 340 square miles) are considered, it is easy to realise that a succession of rainy years would cause a very appreciable rise in the level of the lake. It may also be remarked that a rise of 3 or 4 feet would make a very marked change in the form and appearance of the northern and southern ends of the lake. The level of the water is practically regulated by the rainfall and the evaporation. If more water is supplied than the evaporation can carry off the surface of the lake will rise; but should the evaporation be greater than the supply the lake will shrink. In winter the evaporation is least and the supply greatest; in summer these conditions are reversed. During a very rainy winter, with its many cloudy days without rain, there would be little evaporation, and a more than usually large supply of water. Unfortunately there is no definite infor-

mation with regard to the level of the lake at different periods of the year, and we are unable to compare the rise and fall with the rainfall of any particular month or of any particular year. Nor do we know how far the Sea of Galilee acts as a regulator of the supply; whether the water of the Dead Sea is liable to any movements from the different barometric conditions which probably exist at the northern and southern ends of the lake at certain times of the year, or whether the silt brought down by the Jordan has altered the shore line near the mouth of the river since the last soundings and surveys were made.

The Dead Sea derives its principal supply of water from the Jordan, but a very appreciable addition is made by the streams of Moab and Edom, and during the rainy season by the winter torrents on the west and south. The daily contribution from all sources has been roughly estimated at over 6,000,000 tons of water, and the daily evaporation at about half an inch. There is a prevalent, but erroneous, belief that the swelling of Jordan, when most water is poured into the lake, is due to the melting of the snow on Lebanon. It is principally caused by the rainfall over its large catchment basin. Its waters begin to rise towards the end of December, and overflow the banks of the Zor, or trough, in which they flow in January and February. They would then fall rapidly if the melting snow added to the lighter March rains did not keep them at a comparatively high level during that month and part of April. After heavy rain the Jordan has been known to rise 4 or 5 feet in 12 hours, and to fall as rapidly. Taking everything into consideration, it seems probable that the level of the Dead Sea is highest early in March and lowest in November.

The following remarks of travellers may now be noted:—Before the commencement of the Jerusalem observations in 1861, Irby and Mangles in June, 1818, found “high-water mark a mile distant from the water’s edge” on the neck of the Lisán. In May, 1838, Robinson found a bank of shingle, near Engedi, 6 or 8 feet high, which bore marks of having been covered by water; and in the same month he infers, from drift-wood in the southern part of the lake, that the level had been 10 to 15 feet higher than it then was. On April 22nd, 1848, Lynch says the water had already fallen 7 feet that season; and Dr. Anderson, the geologist of the American Expedition, writes that there was drift-wood three miles from the south end of the lake, and he conjectures

that the water occasionally extended eight or ten miles south of its then position, covering the flat plain. In September, 1858, after a very hot year, Sir George Grove saw drift-wood 10 or 12 feet above the then level of the sea. He also says that the island at the north end, *Rajm el-Bahr*, was 10 or 12 feet out of water and connected with the shore by a narrow causeway 100 yards long. He adds that the isthmus is concealed when the water is at its full height.

On the 12th March, 1865, after a hot summer and a dry winter (8·8 inches below the average), I found the level of the lake to be 1,292·13 feet below the Mediterranean, and that the water had already fallen $2\frac{1}{2}$ feet. I estimated that there would be a further fall of 6 feet from information given by the Bedawin. I had to swim out to the island mentioned by Sir George Grove, which was then about 3 feet above the water. Since 1863 the island appears to have been seen by travellers until 1892, when it is said to have disappeared. This disappearance took place during the third year of the heavy rainfall period which commenced in 1890 (the average for the three years, 1890–92, was 8·6 inches above the 32-year average). Last year the rainfall was only 17·1 inches, or 8·1 inches below the average, but this failure would not be sufficient to counteract the excess from the floods of 1897, and the heavy rain of previous years.

The subject is of so much interest that I hope steps may be taken to obtain observations of the level of the Sea of Galilee and of the Dead Sea at different periods of the year. There should be no difficulty in the case of the Sea of Galilee, where there is a settled population. In the case of the Dead Sea I would suggest that a mark be cut on the rocks near 'Ain Feshka, or at some convenient point, at a measured height of 8 or 10 feet above the level of the water on November 1st, when it is at its lowest, and that the level of the water with reference to this mark be measured at the end of each month of the rainy season. I would also suggest that travellers be asked to send to the Fund notes on the level of the lake with reference to the drift-wood which marks the high-water line, and the dates of their visits. I hope, too, that the boats on the Lower Jordan may be utilised for making soundings, and for barometric observations at different points on the shore of the lake.

NOTE BY SIR CHARLES WARREN.

I quite agree with this paper, and though I think there is volcanic action at work about the lake, I do not think that it affects the annual variation of level of the surface of the Dead Sea, which I attribute to the varying amount of rainfall or snow balanced by evaporation from the surface of the water.

SPORT AMONG THE BEDAWÏN.

By W. E. JENNINGS-BRAMLEY, Esq.

EVERY Bedawi is a sportsman both from taste and necessity. A day after gazelle, ibex, or hare means not only a day's keen enjoyment, but a possible change in the monotonous daily diet of bread and water which, except on rare occasions such as a festival or the treating of guests, must be his.

The sport of Sinai *par excellence* is ibex hunting. The ibex, called by the Bedawîn Jatel, or more locally Seid (male, Beden), is found on almost all the hills of Sinai. High hills, such as Jebel Ruram, Jebel el-Haisie, or the hills of Kadus, lying furthest off the caravan roads, afford the best sport.

Every Bedawi is a sportsman at heart, as I have said, but some can only take a day when travelling to and from neighbouring towns to fetch the necessary provision of corn, whilst others make ibex hunting their business. The latter are generally members of large families, who can spare them and provide meal for the tent, usually men who, having better rifles than the rest—a Remington, perhaps, or a Martini—are better equipped for the purpose.

Ibex are sometimes stalked and shot from behind stone butts raised for the purpose near water or close to feeding grounds; but the usual way is to hunt them with dogs—a breed called Dirra, originally, I believe, a cross between the greyhound, Slooge, and the pariah dog. Two of these are taken by the huntsman and, as soon as the ibex is seen, let loose. They chase it up to some peak, where the huntsman can follow until near enough to get a certain shot.