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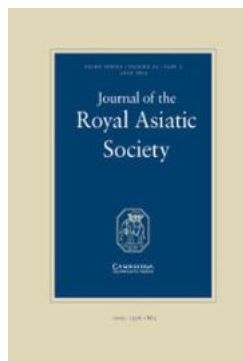
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ART. XV.—*Note on the Saltness of the Red Sea, by J. G. MALCOLMSON, M.R.A.S., Surgeon, Madras Establishment.*

Read April 15, 1837.

IN the Asiatic Society Journal for September 1835, Mr. Prinsep, the distinguished Editor of that invaluable publication, has given the result of the examination of two bottles of sea-water; one from the Indian Ocean, the other from the Red Sea. The officers of the *Hugh Lindsay* steamer having reported that, in consequence of the greater saltness of the Red Sea than of the Ocean, it was necessary "to blow-off much more frequently while in that part of the voyage," Lieut. Burnes had, therefore, brought to India a bottle of the water of the Ocean, and of the Red Sea, which were found to have (at the temperature of 86°), a specific gravity of 1.0254 and 1.0258 respectively; too small a difference to cause any sensible effect in blowing-off. But as lime might exist in greater quantity in the inland sea, the analysis was principally directed to ascertain the proportions of sulphuric acid and lime, the precipitation of which is the cause of the necessity of blowing-off.

The following are the results :

	Indian Ocean.	Red Sea.
Sulphuric acid	1.82 . .	1.80
Lime	0.70 . .	0.82
Common salt	32.8 . .	33.5

Mr. Prinsep proceeds to quote an account of an analysis by Dr. Ure, of a specimen of water brought from near Berenice, by Mr. Wilkinson, to the following effect:—"The specific gravity is 1.035; and 1000 grains of water contain forty-three of saline matter, of which about four grains are muriate of lime, with a little muriate of magnesia, and the remainder muriate of soda, with a little sulphate of magnesia. The specific gravity of water of the open ocean, in the same latitude, is only 1.028, and contains not more than thirty-six grains of saline matter in a similar quantity." Mr. Prinsep accounts for the discrepancy, by supposing the water examined by Dr. Ure, to have been obtained from an insulated position near the shore, and adds,—“the hydrometer is in all cases the safest test, and it is a pity that it had not been resorted to in the steam navigation of the Mediterranean sea, which has been the source of such contradictory statements.”

Having furnished myself with the necessary apparatus, previous

to my return from India by the Red Sea, the beginning of last year, with a view of this very subject, I found the specific gravity of the sea, from Mangalore in Malabar, along the Indian coast to Bombay; in that harbour (in December, 1835); and of the ocean between India and Cape Furtak and Bab-el-Mandeb, in Arabia, to be 1.0265. The temperature of the water did not vary more than a few degrees, and, being barely sufficient to cause a difference of a few hundredths of a grain, may be safely neglected. The temperature of the sea opposite to Mangalore was 83° , which it retained till north of Fort Victoria, latitude $17^{\circ} 56'$ North, when it was found to have fallen to 79° , and in Bombay Harbour was as low as 76° . Throughout the voyage to the Arabian coast (in January) it was about 79° when the winds were slight, but was remarkably affected by the freshening of the breeze, falling soon after to 76° , that of the air varying from 74° to 76° . On the 12th of January, when coming in sight of Cape Furtak, the sea was 75° ;—the thermometer in the cabin being 73° at eight, A. M., and 75° at three, P. M., the wind blowing pretty fresh from N.E. by N., and the wet-bulb thermometer falling to $65^{\circ} 5$; while Daniell's hygrometer failed to form any dew with ether of ordinary strength.

In the roads of Mocha, and near Kamran Island, the Red Sea hardly differed in specific gravity from the ocean, while off Cosseir, at a considerable distance from the shore, it attained the specific gravity of 1.035, nearly corresponding to that brought from Berenice by Mr. Wilkinson. When it is considered that no river runs into this long and narrow gulf, surrounded by dry and burning sands, it is not to be wondered at, that it should be so remarkably salt; an effect hardly visible at Mocha, from its proximity to the ocean, from which a current almost constantly sets into the sea. I regret that severe sickness prevented my ascertaining the rate at which the density of the sea increases on sailing from Mocha to Cosseir. Had Mr. Burnes stated from what part of the sea he took the water, I have no doubt that the result of Mr. Prinsep's examination would have corresponded with that above given.

That this great increase of specific gravity would sensibly affect the boilers of a steam engine, will be evident from the following remarks:—Dr. Wollaston, in the *Philosophical Transactions* for 1829, in a paper on the saltness of the Mediterranean, gives a formula for finding the quantity of salt by the specific gravity, which I have found to give sufficiently correct results, when compared with the experiments on the waters of the Indian Seas. He directs the excess of the specific gravity to be multiplied by .144, which gives

the saline contents, plus (+) a quantity of water retained by the deliquescent salts when dried at 212°. In the present case, it will be better to employ the factor ·134, which will give the salts dried at a temperature at or above 300°. Hence, if a portion of water of the Indian Ocean,¹ of specific gravity, 1·0265, which I found it, afforded sulphuric acid 1·82 grains, and lime ·70, that of Cosseir would, in the same bulk, furnish 2·40 grains, and ·955 of a grain; or about *one-third* more, which, in so insoluble a salt as sulphate of lime, must exert a considerable influence over the rapidity of deposit in the boilers, and be the cause of some delay in the voyage.

¹ I have used Mr. Prinsep's analysis and my own specific gravity of the Indian Ocean, as by this means the proportion between the saltness of the ocean and the Sea of Cosseir is better seen. If this is objected to, it will make the excess still greater.
