

both on the surface and at intervals below the surface, down to the bottom. All the serial temperatures taken in Lochs Katrine, Arklet, Achray, Drunkie, Vennachar, Doine, Voil, and Lubnaig have been collected together in the table,\* and, in order to make the record more complete, the temperatures taken by Jardine in 1812 and 1814 in Loch Katrine are given in the first two columns.

*Loch Katrine.*—The surface temperatures taken in Loch Katrine during the seven days from June 5 to 11, 1897, are extremely interesting, as illustrating the effect of the wind. The range of temperature during this time was  $12\frac{1}{2}^{\circ}$ , from  $45^{\circ}\cdot3$  to  $57^{\circ}\cdot8$ , the highest reading being observed at Trossachs pier on the evening of June 5, and the lowest at the same place on the evening of June 9. This was evidently the result of a strong east wind, which commenced to blow on the 6th, and continued from the same direction till the 9th, blowing the warm surface water before it from the east towards the west end of the loch, while colder water from below was drawn up to the surface at the east end of the loch to take its place. The gradual cooling of the water at the east end of the loch is well shown by the temperatures taken at Trossachs pier from day to day. thus at 6.30 p.m. on June 5 the temperature was  $57^{\circ}\cdot8$ ; at 11.30 a.m. on the 6th it was  $56^{\circ}\cdot2$ ; and at 4 p.m.  $55^{\circ}\cdot3$ ; at 7 a.m. on the 7th it was  $49^{\circ}\cdot2$ ; at 10.30 a.m. on the 8th it was  $46^{\circ}\cdot3$ ; and at 7.15 p.m. on the 9th it was  $45^{\circ}\cdot3$ . By 9.30 a.m. on the 11th it had again risen to  $50^{\circ}\cdot1$ . The effect of the wind was also shown by a series of surface temperatures taken from the steamer on its way from Stronachlachar pier to the Trossachs pier on the evening of June 9. thus at Stronachlachar the temperature was  $52^{\circ}\cdot6$ ; near the waterworks,  $52^{\circ}\cdot0$ ; near Letter,  $49^{\circ}\cdot6$ ; near Brenachoil,  $48^{\circ}\cdot8$  and  $48^{\circ}\cdot0$ ; near Ellen's isle,  $47^{\circ}\cdot4$  and  $47^{\circ}\cdot0$ ; and finally at Trossachs pier,  $45^{\circ}\cdot3$ . It will thus be seen that it is very unsafe to rely on a single observation at one spot as giving a sure indication of the temperature of the surface waters of a loch as a whole at any given season. A year later (from June 4 to 9, 1898) the temperature of the surface waters of Loch Katrine was not observed to fall below  $50^{\circ}$ . On November 26, 1897, the surface temperature varied only from  $46^{\circ}\cdot8$  to  $47^{\circ}\cdot4$ , and on April 13 and 15, 1899, from  $41^{\circ}\cdot2$  to  $42^{\circ}\cdot7$ .

The serial temperatures in Loch Katrine are shown graphically in the accompanying curves (Fig 13), which exhibit the march of temperature in the waters of the loch throughout the year. The curve for April shows that the water from top to bottom has a temperature ranging between  $41^{\circ}$  and  $42^{\circ}$  Fahr. In the two curves for June the heating effect of the sun on the surface layers is indicated, but in depths beyond

---

\* Temperature observations in the surface waters of some of the lochs under consideration have been taken by Mr. Thomas Scott, and the results published in the *Annual Reports of the Fishery Board for Scotland*.