

The Pass of Rebhoan.

The Cairn.



Margaret's Coffin.

From Aviemore (at 9 p.m.)

CAIRNGORM, 26TH JUNE, 1909.

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SIR JOHN MURRAY'S SURVEY OF THE  
CAIRNGORM LOCHS.

BY C. G. CASH, F.R.S.G.S.

[In this article the passages in square brackets are mine ; but most of the article is copied from the published accounts of the Bathymetrical Survey of Scottish Lochs and from the Report of the 1901 meeting of the British Association. Thanks are due and are hereby paid for kind permission to print copies of reports and maps.]

About forty years ago excellent bathymetrical charts of Loch Lomond and Loch Awe were published by the Hydrographic Department of the Admiralty, based on surveys undertaken by naval officers. Some of the general charts of the Scottish coasts published by the Admiralty also show a few soundings down the centres of the fresh-water lochs forming the Caledonian Canal, viz., Loch Ness, Loch Lochy, and Loch Oich, but the charts of Lochs Lomond and Awe represent the only systematic surveys of the fresh-water lochs in Scotland that existed previous to the year 1883.

About that time many scientific men in Scotland felt that a survey of these fresh-water lochs should be undertaken ; which led to the Council of the Royal Societies of London and Edinburgh bringing this subject under the notice of Her Majesty's Government.

[The Council of the Royal Society of Edinburgh applied to the Treasury to have at least *some* of the Scottish lochs surveyed, pointing out the importance of such a survey as aiding in the study of the physical, biological, and geological conditions and relations of the lochs. The declination of the Treasury contained this amazing statement of *reason*, "My Lords are informed that the nautical surveys of Loch Lomond and Loch Awe were undertaken by naval officers in the interests of navigation, and that the same considerations do not apply to the other lochs of which surveys are suggested. My Lords are also informed that the proposed bathymetrical surveys do not come within the function of the Survey Department of the Office of Works (late Ordnance Survey)." The Government was questioned in the House of Lords, and the Royal Society of London also asked for the making of the survey. But "there was no practical outcome from this correspondence; the Government declined to undertake any of the proposed surveys."]

In the year 1888 Mr. J. S. Grant-Wilson published in *The Scottish Geographical Magazine* [vol. iv., p. 251] an account of Lochs Tay, Earn, Rannoch, and Tummel in Perthshire, with special reference to the glaciation of the district, and he gives small contoured maps of these lochs [on a scale of one inch to a mile] in which the positions of some of the deepest soundings are laid down.

During the twelve years from 1896 to 1908 a bathymetrical survey of the fresh-water lochs of Scotland was carried out under the direction of Sir John Murray, the late Mr. Frederick Pattison Pullar, and Mr. Laurence Pullar. [Mr. F. P. Pullar was associated with Sir John Murray in the earlier stages of the systematic survey, and himself designed and constructed the sounding machine used. A figure and description of this machine is given in *The Scottish Geographical Magazine*, vol. xvi., p. 198. On February 15th, 1901, Mr. F. P. Pullar was drowned in Airthrey Loch while gallantly assisting to rescue skaters who had been immersed through the breaking of the ice.

An obituary notice of him appeared in *The Scottish Geographical Magazine*, vol. xvii., p. 148, from which we extract the concluding paragraph: "Mr. Pullar was beloved by all who knew him. He was a man of great bodily and mental activity, lively disposition, generous and brave, knowing no fear. His friends were justified in believing that a great future lay before him. His promising career has been cut short by an act of devotion. He sacrificed his life in an heroic endeavour to save the life of another."]

In his presidential address to the Geographical Section of the British Association at Glasgow in September, 1901, Dr. H. R. Mill said, "It is with profound satisfaction that I now make an announcement—by special favour the first public announcement—of a scheme of geographical research on a national scale by private enterprise. Sir John Murray and Mr. Laurence Pullar have resolved to complete the bathymetrical survey of all the fresh-water lakes of the British Islands. Mr. Laurence Pullar will take an active part in the proposed survey, and has made over to trustees a sum of money sufficient to enable the investigation to be commenced forthwith and to be carried through in a comprehensive and thorough manner. It is intended to make the finished work an appropriate and worthy memorial of Mr. Pullar's son, the late Mr. Fred Pullar, who had entered enthusiastically upon the survey of the lochs of Scotland, and whose heroic death while endeavouring to save life in Airthrey Loch last February must be present to the memory of many of you."

[The reports of the survey of the Scottish lochs were at first published serially in the *Geographical Journal*, and in *The Scottish Geographical Magazine*, the former journal issuing about half of the reports, and the latter rather less. The Royal Geographical Society in 1908 issued the remaining reports in a single separate volume. In the serial issue the reports were accompanied by maps on a scale of three inches to a mile, the depths of the water being shown by tints of blue, and the heights of the

surrounding land by tints of brown. In the volume the land was left uncoloured. There can be no question that the earlier maps were the finer and more effective. All the maps were produced by Batholomew, and exhibit in the highest degree the excellence of execution for which that firm is famous.] It is proposed to collect all the maps and descriptions of the Scottish lochs [that appeared serially] into a series of volumes, and these, it is hoped, will be published during the year 1909, along with much new matter concerning the physical, chemical, and biological conditions of the Scottish Fresh-Water Lochs.

[This new issue will not appear till 1910, and will be in six volumes: vol. 1, general discussions of the various scientific aspects of lakes in general, and of Scottish lochs in particular; vol. 2, the text of the descriptions of the Scottish lochs and a bibliography of limnology; vols. 3, 4, 5, 6, the maps of the Scottish lochs. In all probability this will have to be a limited issue, as the expense of re-printing the maps is greater than the available funds would permit, and the present stock of printed map sheets is small.]

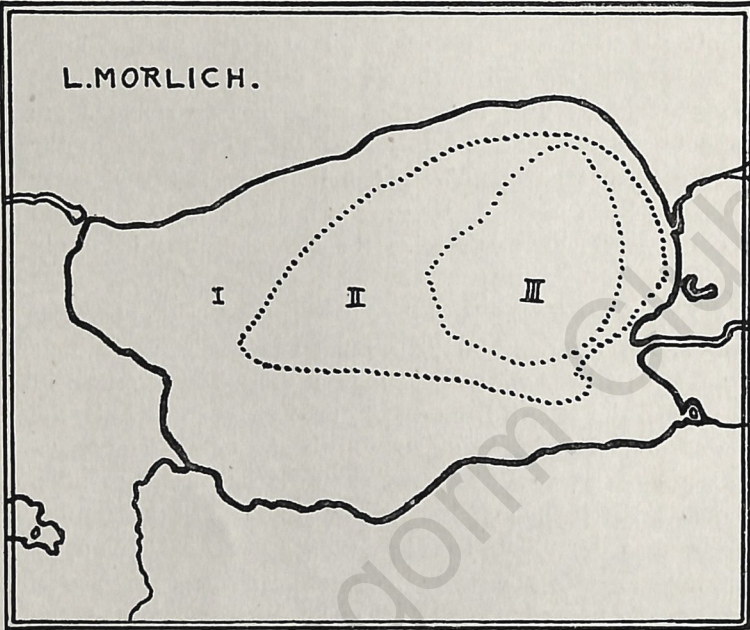
[The Cairngorm Lochs included in the survey are Morlich by Mr. R. C. Marshall, Builg by Drs. T. N. Johnston and L. W. Collet, and an Eilein and Gamhna by Mr. R. C. Marshall. It will be seen from this list that none of the specifically "Cairngorm" lochs has been surveyed, for we miss Einich, Avon, Etchachan, Mhic Ghillie Chaoile, the Lochan Uaine of Cairn Toul and that of Ben Mac Dhui, the "Corrie" Lochans of Braeriach and Cairngorm, Suarach (or Steurtach), na Beinne and an t'Seilich of Glen Einich, and the Dubh Lochan of Beinn a' Bhuid, most if not all of which are surely worthy of survey. The reason for their omission is given in the statement, "As a rule, those lochs on which there are now no rowing boats, or to which boats could not be easily transported have been omitted in the meantime," though this scarcely excludes Loch Einich. The omitted lochs are not even shown on the index map of the Spey basin—from which also Braeriach is omit-

ted—, though, oddly enough, Loch Avon is shown on the index map of the Dee basin. Two of the omitted lochs are thus mentioned in the text of the report, "The most important of the lochs that could not be sounded are Lochs Eunach and Avon, lying at a high elevation in the Cairngorm mountains." The omission especially of these two lochs is much to be regretted, and it is to be hoped that they may yet receive the attention that is surely their due.]

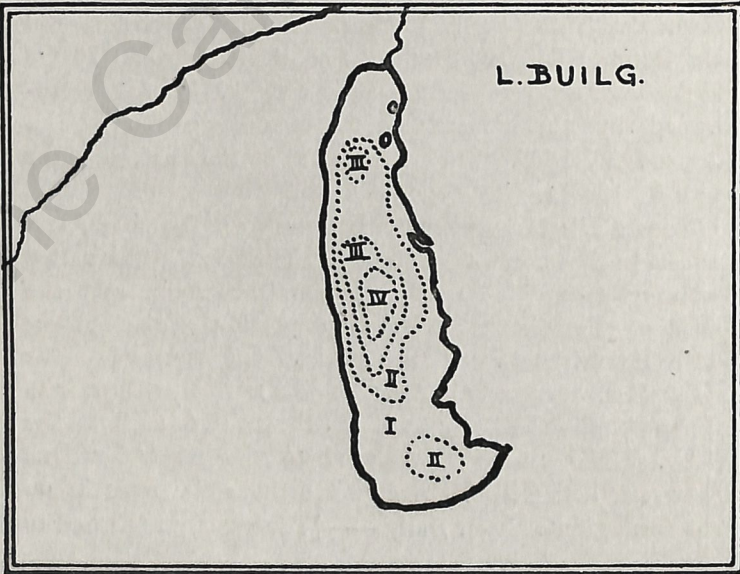
*Loch Morlich*, the largest of the Spey lochs in superficial area, lies in Glen More, surrounded by woods, about four miles east of Aviemore. The loch is sub-rectangular in outline, the length from east to west exceeding a mile, the maximum breadth being two-thirds of a mile. The superficial area exceeds 300 acres, or nearly half a square mile, and the drainage area is large—exceeding 17 square miles. The maximum depth of 49 feet was recorded comparatively close to the east shore, whence the water shoals gradually towards the west, the western portion of the loch being very shallow; nearly 60 per cent. of the entire lake-floor is covered with less than 10 feet of water. The volume is estimated at 192 million cubic feet, and the mean depth at nearly 15 feet. The loch was surveyed on October 10, 1903, when the elevation was 1045·0 feet above sea-level, as compared with 1045·8 feet determined by the officers of the Ordnance Survey on August 16, 1866. The temperature of the surface water was 49°·1 Fahr.

*Loch Builg* lies nearly 20 miles east of Aviemore, and about 6 miles north-west from Balmoral castle, in a valley running north and south between Glen Avon and the head of Glen Gairn. A small proportion of the outflow finds its way into the river Gairn, and thence into the river Dee, as already stated; but the normal outflow is to the north, by the Builg burn and the river Avon, into the Spey. The reader is referred to the paper by Drs. Johnston and Collet, already cited, for some remarks on the formation of Loch Builg.—[The passages referred to

L.MORLICH.



L.BUILG.



are placed here in parenthesis.] Loch Builg might also be included among the lochs of the Dee basin, since a certain proportion of its overflow drains through the moraine matter at its southern end into the river Gairn, but as its normal outflow is at the northern end into the river Avon, it will be dealt with among the lochs of the Spey basin. Lochs Muick, Callater, and Builg were made the subject of a short paper by Drs. Johnston and Collet, "On the formation of certain lakes in the Highlands." Proc. Roy. Soc. Edin. vol. xxvi., p. 107.—The loch is less than a mile in length, by a quarter of a mile in maximum breadth, the superficial area being about 77 acres. The maximum depth of 86 feet was observed approximately in the middle of the loch. The volume of water is estimated at 93 million cubic feet, and the mean depth at nearly 28 feet. The floor of the loch is somewhat irregular, there being three deep basins separated by two ridges. The largest and deepest basin occupies the central portion of the loch, while towards the northern end two soundings in 50 feet were taken, the greatest depth recorded on the intervening ridge being 34 feet; near the southern end a depth of 36 feet was found, the deepest sounding on the ridge separating it from the central deep basin being 21 feet. About 58 per cent. of the lake-floor is covered by less than 25 feet of water.

The loch was surveyed on July 12, 1905, when the elevation was found to be 1585·0 feet above the sea; the elevation given to the Ordnance Survey map is 1585·3 feet, but the date when levelled is not indicated. Temperatures taken on the deepest part of the loch showed a range from surface to bottom of 12° Fahr., the readings being as follows:—

Surface	- -	61°·5 Fahr.	50 feet	- -	52°·4 Fahr.
25 feet	- -	56°·5	85 "	- -	49°·5 "

*Loch Gamhna*, the smallest of the Spey lochs surveyed, lies about 2 miles to the south-east of Loch Alvie, on the opposite bank of the River Spey, and immediately to the south of Loch an Bilein, into which it drains. Irregular

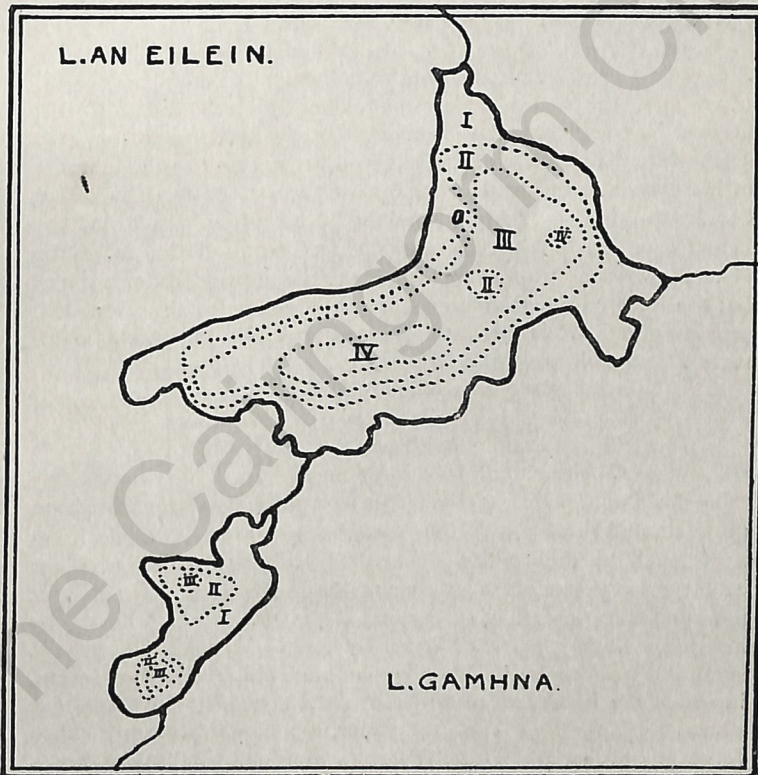


in outline, the loch trends in a south-west and north-east direction, and is less than half a mile in length by one-fifth of a mile in maximum breadth, covering an area of about 25 acres. The maximum depth of 41 feet was recorded in a small basin at the south-west end of the loch; there is a second deep basin, having a maximum depth of 29 feet, lying in the wide part of the loch towards the north-east end, these two basins being separated by a shoaling covered by only 4 feet of water, where the outline of the loch is constricted. The volume is estimated at 10 million cubic feet, and the mean depth at  $9\frac{1}{2}$  feet, nearly three quarters of the lake-floor being covered by less than ten feet of water. The loch was surveyed on October 14, 1903, when the elevation was found to be 889.3 feet above the sea, or 6 feet lower than that determined by the Ordnance Survey officers in September, 1868, viz., 895.2 feet. This lowering is due to the banks of the stream giving way, and consequent outflow into Loch an Eilein. The surface temperature was  $46^{\circ}1$  Fahr.

*Loch an Eilein* lies about 3 miles south of Aviemore, amid picturesque surroundings. At the time of the survey a couple of ospreys were nesting in the ruins of the castle on the island. [This statement about the ospreys seems to have arisen from a misreading of the reporting surveyor's notes. There were certainly no ospreys nesting at Loch an Eilein in 1903. See C. C. J. vol. v., p. 278]. Somewhat crescentic in outline, the loch exceeds a mile in length, along the axis of maximum depth from south-west to north-east, the maximum breadth being nearly half a mile. The superficial area is about 130 acres, and the drainage area, including Loch Gambna, is almost  $2\frac{3}{4}$  square miles. The maximum depth of 66 feet was recorded towards the south-west end, and deep water occurs also near the north-east shore, where soundings in 51 and 47 feet were taken, the water shoaling in the central part of the loch to a depth of 20 feet. The volume of water is estimated at 144 million cubic feet, and the mean depth at  $25\frac{1}{2}$  feet, 54 per cent. of the lake-floor being covered by less than 25 feet of water.

The loch was surveyed on October 14, 1903, when the elevation was found to be 839.6 feet above the sea, or nearly a foot lower than that observed by the Ordnance Survey officers in September 21, 1868, viz., 840.4 feet above sea-level. Temperatures taken in the deepest part of the loch showed a range from surface to bottom of only  $\frac{1}{2}^{\circ}$  Fahr. :—

Surface	- -	49°·2	Fahr.	40 feet	- -	48°·8	Fahr.
10 feet	- -	49°·0	"	50 "	- -	48°·7	"
20 "	- -	48°·8	"	60 "	- -	48°·6	"
30 "	- -	48°·8	"				



[The maps herewith are black-and-white hand drawn imitations of the maps accompanying the reports. The depths are indicated thus :— On the maps of Lochs Morlich, an Eilein, and Gamhna, zone I less than 10 feet, zone II between 10 and 25 feet, zone III between 25 and 50 feet, zone IV more than 50 feet ; on the map of Loch Builg, zone I less than 25 feet, zone II between 25 and 50 feet, zone III between 50 and 75 feet, zone IV more than 75 feet].