SOME HIGHER LOCHS AND LOCHANS IN THE CAIRNGORMS

KEN THOMSON

In the regrettable absence of glaciers in the Cairngorms since the end of the Loch Lomond Readvance, the higher lochs and lochans of the area seem next best for study and enjoyment and are certainly worth the occasional reference and article in this *Journal*. An irreverent limnologist (a lake scientist) has said that "*a lake is no more than a bulge in a river*", but bodies of standing water offer a rich variety of sites and environments. This article brings together some scraps of information – historical, scientific and "other" – for Cairngorms lochs in general, and for some in particular, which have interested the author while by no means pretending to be comprehensive.

As with Scottish islands, the number of lochs and lochans in the Cairngorms is an uncertain quantity – not only due to the various alternative boundaries that might be taken to encompass the mountain range, but also as to the minimum surface area (itself a variable quantity) to be considered. The Cairngorms National Park Authority carefully says that "*there are around 60 lochs throughout the Park, and many lochans*". And lochans are even known to appear, e.g., Lochan a' Chreagain where the Quoich "*reluctantly enters the Dee*", or disappear, e.g., on the upper ridge of Carn na Drochaide north-west of Braemar. Others have no doubt disappeared over time through their natural tendency to fill up with detritus brought down from the slopes above.

This article seeks to cover all bodies of water in the higher reaches of the Cairngorms down to around 0.1 ha (10m square) in area: roughly, those at an altitude over 400m (1300 feet), plus a few of the major lochs below that altitude, e.g., Lochs Morlich, Muick and Lee. Lochs west and south of the A9, e.g., in the Monadh Liath, are not covered. A data set compiled by the author using these criteria includes about 240 lochs and lochans.

Historical

The first comprehensive examination of Scottish lochs was the 1897-1909 *Bathymetrical Survey of the Fresh Water Lochs of Scotland*. Its text and its rather beautiful engravings are easily available via the National Library of Scotland's website. In 1883 and 1884, the Royal Societies of Edinburgh and London strongly represented to the

government the value of such a survey, but the Treasury replied that inland water fell outwith the functions of the Admiralty, whilst the Ordnance Survey was to confine its attentions to dry land! The Survey was therefore undertaken with private funds by the experienced oceanographer Sir John Murray, (photograph 1 below) at first on a small scale assisted by his young friend Fred Pullar of the once well

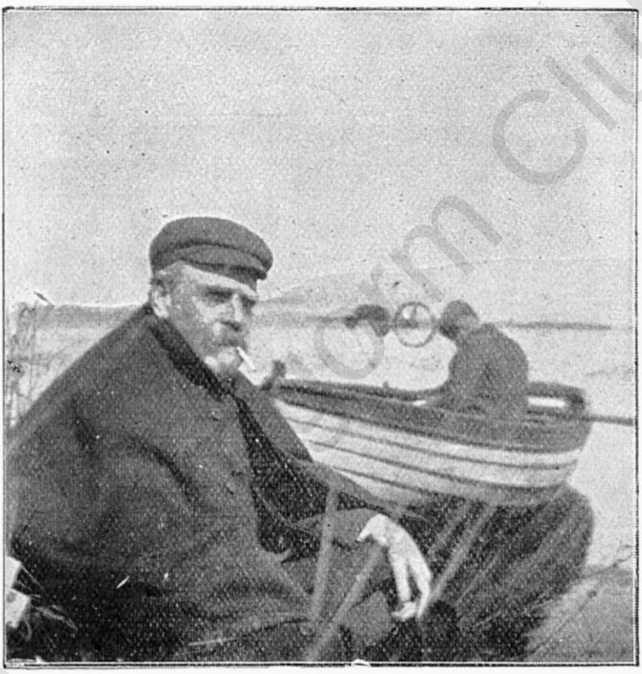

FIG. 2.—Sir John Murray, K.C.B.

(From a photograph taken by the late F. P. Pullar, F.R.G.S., during lunch-time on their last sounding expedition together. Loch Leven, 1st September 1900.)

1 Sir John Murray

-known dry-cleaning family. However, in 1901 Fred drowned whilst rescuing people who had fallen through ice on Airthrey Loch near Bridge of Allan. Murray nearly abandoned the Survey, but a £10,000 donation from Fred's father, Laurence Pullar, enabled the Survey to continue, with a substantial team of assistants in the fields of surveying, geology, chemistry, biology, etc.

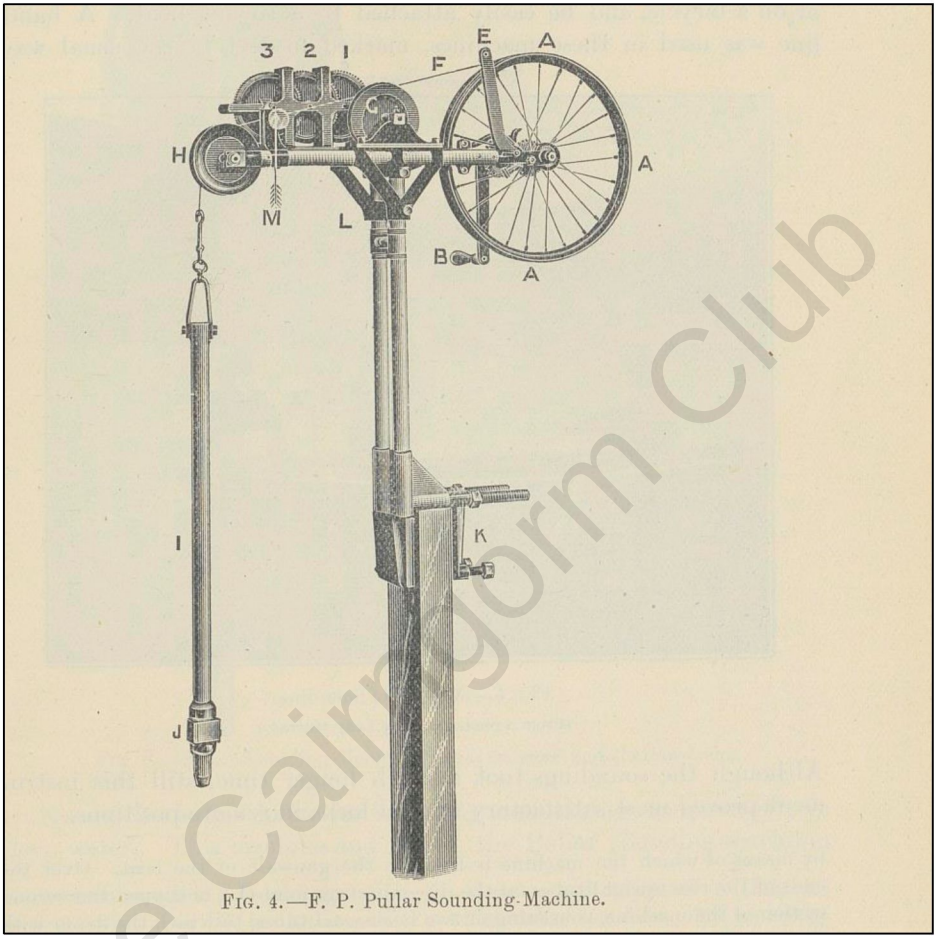

FIG. 4.—F. P. Pullar Sounding-Machine.

2 The Pullar Sounding Machine

After some trials, a "Pullar sounding-machine" (photograph 2. above) based on bicycle tubing and a drum of 1,000 feet of galvanised wire was fixed to the gunwale of a rowing boat. The device worked "*admirably and accurately*" and was subsequently used by Robert Peary in his Arctic expedition of 1905. A simpler apparatus, capable of being carried on a bicycle, was used on smaller and remoter lochs. Lake deposits were collected in brass tubes attached to the lead. After difficulties with more elaborate methods such as the use of a sextant, depth soundings were taken along fixed transects, the oarsman taking a fixed number of strokes

to ensure even intervals. This was found to be remarkably accurate except across wide stretches without islands, and the results are still used in OS maps today.

Over 10 years, some 562 lochs all over Scotland were surveyed, with their depths, widths, volumes and temperatures being measured, and their biological species (29 new at that time) enumerated. The Survey included 6 lochs in the Aberdeenshire Dee basin, 16 in the Spey basin, and 67 in the Tay basin, but the difficulty of getting a boat to the water led to the exclusion of Lochs Avon, Etchachan and Einich, as well as the Dubh Loch, Lochnagar itself, and the many other high-lying lochans in the Cairngorms.

Modern methods have of course moved on. A current unofficial website (sites.google.com/view/lochbagging) lists 141 lochs – named the "Crawfords", after the website founder – within the Cairngorms National Park, 9 above Munro height (914m), and 23 above Corbett height (762m). The highest are Lochan Buidhe to the north of Ben Macdhui at 1122m, and – though a rather dubious "lochan" – at the Wells of Dee on Braeriach, even higher at 1213m. The lowest Cairngorms Crawford is the Fairy Loch in Glen Tanar, but at 159m that is well below the altitudes considered in this article.

Data

There are currently two major official databases for lochs and lochans in Scotland and beyond. For about 3,000 Scottish lochs, the Standing Waters Database (SWD) – maintained by the statutory nature conservation agencies in Scotland, England and Wales – gives a six-figure OS grid reference, altitude to within 10m, and surface area to about 0.1 ha, plus environmental survey information for the larger lochs. The UK Lakes Portal (UKLP) – originally developed in 2004 by University College London and the UK Centre for Ecology & Hydrology– is an inventory of about 25,000 water bodies in Scotland with a surface area over 1 ha. For each "lake", the website (eip.ceh.ac.uk/apps/lakes/index.html) gives basic information such as surface area, location and elevation, while subsidiary panels give additional data on shoreline length, surrounding land cover, connectivity (e.g., Strahler numbers; a measure of stream branching complexity), chemistry and biology.

The formation of lochs is a geomorphological process, driven by the underlying geology, the actions of glaciers, and more recent erosion. Most of the Cairngorms glens are believed to have originated as lines of weaknesses formed, perhaps surprisingly, by hot water ("geothermal alteration"), and later eroded by ice and water. In these glens, lochs have resulted from both "rotational flow" of the ice deepening a hollow (a corrie) until a rock lip retained water, and at lower altitudes from the glacial deposition of material in moraines behind which water has been trapped. Other lochs are in "kettle holes" left behind by ice blocks isolated from the main glaciers, most notably Loch Morlich, but probably also many of the smaller lochans found on flatter moor, especially in the south of the Cairngorms as defined here.

Every loch has its catchment area, whose size and nature determines the amount and characteristics of its water as well as its landscape setting, and nearly all have their inlets and outlets (usually several and one, respectively), even if these are very small and fragmented in the case of small pools lying in flat areas. Together, these define the loch's retention time (the mean time that water spends in the loch), which has been found to vary from 1.2 hours to 4.25 years – a period that presumably varies greatly with rainfall and thaw.

The variety of life forms to be found in lochs, even in higher-altitude ones such as those in the Cairngorms, is far too large to be discussed at any length here, let alone their interactions (e.g., the food web, parasitism) and their relationships to the physical environment (e.g., water depth and acidity, seasonality). But in general, the ecosystems of the higher Cairngorms lochs extend from plankton (e.g., algae), bryophytes (e.g., mosses) and macrophytes (aquatic plants), which form the food base, through invertebrates such as beetles and dragonflies, to vertebrates such as fish, frogs and waterfowl. Most is known about the larger species, particularly fish and birds, but many of the smaller species are difficult to study (as well as boring to many!), so that scientific knowledge is incomplete.

The higher and smaller the loch, the more oligotrophic or dystrophic it is likely to be, i.e., to have low or very low nutrient status. This limits the number of species able to survive, and the maximum size of at least the larger ones such as fish. However, the peat surrounding many of the smaller lochans in the high flat Cairngorms moors can lead to higher-

than-expected diversity, though dominated by sphagnum mosses and lesser bladderwort, along with associated species such as some dragonflies. The larger oligotrophic lochs are also acidic, but are dominated biologically by salmonid species, while their plant life can extend to shoreweed, quillwort, water lobelia and awlwort.

The Cairngorms host several designations, being a Site of Special Scientific Interest (SSSI), a RAMSAR Wetlands site, a Special Protection Area (SPA) for birds, and a Special Area of Conservation (SAC). The SSSI Site Management Statement says:

"*Fringed with ice polished boulders, those* [lochs] *over 600 m are oligotrophic and arctic/alpine in character, with a very impoverished fauna and flora and have continuous ice cover from December to May in most winters. Winter populations of phyto- and zoo- plankton develop below the ice while diatom growth occurs only after the ice has melted. The corrie and plateau lochs, on rocky substrates above 900 m, suffer the harshest climate and the lowest levels of nutrient, leading to low species diversity of flora and fauna, mainly phytoplankton with a few zooplankton and invertebrates, but no aquatic plants (macrophytes) or fish. The larger glacial trough lochs in Glens Einich and Avon enjoy more sheltered conditions. The occurrence of finer sediments in Loch Einich allows the limited establishment of higher plants such as shore-weed, six-stamened waterwort and bulbous rush, and several species of fish are also found, including salmon, sea trout and Arctic charr.*"

The RAMSAR statement covers five Cairngorms lochs (Etchachan, Uaine, Coire an Lochain, Avon and Einich), noted as: *"exceptional examples of high-altitude oligotrophic lochs [which] are of considerable limnological value and support highly specialised populations of zooplankton and phytoplankton",* and as being *"in favourable condition".*

At one time, trees would probably have been found around all but the highest lochs, but the effects of historical climate change (cooler, wetter, windier conditions) and relentless grazing has left only scrub remnants above ground, and fossilised remains in the deeper waters, as well as in the surrounding bogs.

In the late 1960s and early 1970s, Jerry Light – the originator of the Garbh Choire Refuge – used snorkel and scuba equipment to carry out scientific work on bryophytes in Lochnagar, Loch Muick, Loch Avon,

Lochan Uaine of Ben Macdhui and Loch Coire an Lochain on Braeriach. He found the bryophyte flora to be "*surprisingly varied*", with most of the 15 species not previously recorded in British lakes.

Salmon and sea trout do not usually reach the higher water bodies of the Cairngorms, and in any case prefer flowing water for spawning. Even brown trout seldom venture above 800m, but they have been noted or caught in Lochnagar lochs, and in Lochs Etchachan, nan Eun near Beinn Iutharn, and Vrotachan. Similarly, eels seldom go above 500m, but have been caught in the Lochnagar loch, at 780m. Humans probably introduced pike into some higher lochs (e.g., Loch Callater at 500m, though they are not found in Loch Muick at 390m), to the detriment of indigenous salmonid-dominated fish communities. They have been found to exhibit "*slower growth, due to a shorter growing season and the low availability of forage fish.*" Arctic charr are a post-glacial relict (a remnant of a formerly widespread species that persists in an isolated area), present in Lochs Einich, Builg, Lee of Glen Esk, and an t-Seilich of Gaick, but are not recorded in Lochs Avon or Muick. They are a conservation feature in several Cairngorms SSSI lochs, including Loch Builg.

While lower-lying lochs are well-known haunts of many bird species, even the higher ones attract residents and visitors, both common and rare. Amongst the former are gulls (common and black-headed), which breed at Loch Tilt, in Glen Derry and near Loch Builg, and even up to 750m. The latter include various divers, and dippers and oystercatchers coming up from their more usual lower-level sites, sometimes as far as the Pools of Dee. Geese, swans and teal have sometimes been noted to use high-level lochs as temporary staging posts.

Perhaps thankfully, there have been few direct human uses of the higher Cairngorms lochs, which have thus been spared most of the touristic attentions nowadays devoted to Loch Morlich. A crannog in Loch Builg (see below) is perhaps an early exception, and no doubt fish received widespread attention then as now. Perhaps some lochside summer sheilings were occupied until the 18th century by those looking after cattle, goats and sheep driven up from lower ground, but most of these seem to have been located on higher, drier, ground. Moreover, numbers (of humans and livestock) are likely to have been small, and

not to have affected much the shape and nature of the water bodies. Dams have been built to establish or enlarge a few lochs and lochans for fishing purposes (or water supply in the case of Loch Einich). Nowadays, in addition to "lochbagging", some hardy souls like to swim in the larger ones, or even to dive under their ice in winter; videos are available online. And a commercial course offers instruction in "altitude diving" (which requires specialised dive plans) in the Cairngorms.

More indirectly, human pollution of loch water by "acid rain" became of pressing interest in the 1970s:

... the production of some algae and mosses increases [but] *the diversity and production of most macrophyte communities decrease with decreasing pH, and the same appears to be true of zooplankton and zoobenthos, though the situation is more complex with invertebrates .... If the acidification is sufficiently great to exclude fish, then their absence as the normal top predators can lead to an unusual abundance of some prey species. Amphibians ... and birds ... can also be affected.*

However, such effects were found to be much more serious in Galloway (e.g., some lochs rendered fishless) than in the Cairngorms (both granitic regions), and the effects of organic soil – particularly peat – reduced the risk of aluminium toxicity. Since 1990, there has been some improvement, arising from reduced emissions from power stations etc.

Some Individual Lochs

Loch Avon, (photograph 3 on the following page), (pronounced, and sometimes spelled, A'an; "river", a Brythonic or Ancient Celtic term). According to Queen Victoria, "Nothing could be grander or wilder", and W. H. Murray considers that the loch's corrie "has no match in Scotland, save only at Coruisk, for utter remoteness and the sense of loneliness imparted". Along with the Shelter Stone, it is the scene of many a description and tale, including the formation of the Cairngorm Club itself on the Dairymaid's Field in 1887. In the 1890s, the loch was *proposed* – initially by a Club Member, Thomas Jamieson – as a source of water "of exceptional purity" for the City of Aberdeen, via an £1,000,000

aqueduct. Club members expressed enthusiasm both for and against this scheme, which eventually fell through.

3 Loch Avon Mike Duguid

Loch Beanie (also Bainnie, suggesting Bainne, or "milky", though perhaps simply from "Ben"; originally called Loch Shechernich, Sesatur, Schechyr, etc.) in Glen Shee has an artificial island, on which the local clan chief is said to have lived. The loch does *not* drain into Glen Beanie!

Loch Brandy (said to derive from *bran dubh*, or "black raven", possibly from its colour) in Glen Clova has The Causeway – actually a curved natural moraine – shallowly submerged at its south end. Several boats have been hauled up to the loch for fishing, but all but one (which was removed after unauthorised usage) were eventually smashed by strong winds. A large area of the corrie headwall has partially slipped downslope.

Lochan Buidhe ("yellow") high on Lochnagar was stocked in 1856 with two dozen trout from Loch Muick. Below the lochan, the remains of an old shooting hut of the Gordons of Abergeldie could still be traced in 1891.

Loch Builg ("bag-shaped") was used to investigate ice cover in the Cairngorms about the time of the Loch Lomond Readvance about 14,000 years ago. Its waters sometimes run in both directions, i.e., north to the Avon and the Spey, and south to the Gairn and the Dee. A possible/

probable crannog – "*period unassigned*", and some 5m in diameter – lies some 12m from the NE shore and is approachable by a ruinous causeway. It is the scene of "Two Lady Members of the Club Bathing" on 9 September 1933 (photograph 4 below). A satellite lochan was the site of a young man's suicide in 1950, exactly ten years after his father did the same in Glen Girnock. In 1961, 15 ATC officers and cadets carried two bomber-type dinghies plus normal camping gear up the loch, "and spent some time paddling across the loch".

September 9, 1933. *Mrs. Donald Sinclair*

TWO LADY MEMBERS OF THE CLUB BATHING IN LOCH BUILG.

4 Ladies Bathing 1933

Loch Callater ("hard water"; Brythonic, not Gaelic) is currently said to contain trout, salmon, eels and perch, and to be a very good water for pike, possibly the highest in the British Isles.

Loch Dubh ("black") on Lochnagar led the New Statistical Account of 1845 to be quite carried away: "*The stupendous overhanging cliffs of*

Craigdhuloch, surpassing in grandeur the celebrated rocks of Lochnagar, rise on the south side of it to the height of more than 1000 feet, and, by throwing their gloomy shade over it, give a dark and sombre appearance to its limpid water ... A mountain rill falls into it from a height of 200 feet, over a projecting rock on the north side, which renders it altogether the most awfully sublime object in these parishes". By contrast, the scenery of Loch Muick is merely "*bold and romantic*"! Its trout may be the descendants of 35 brought from Loch Muick in 1852.

Dubh Lochan ("black"), Beinn a'Bhuird's main loch (photograph 5 below), provides fine camping/bivvying sites on its shores, sheltered

5 Dubh Lochan Beinn a'Bhuird Mike Duguid

from the westerlies, and not far away is the Smith-Winram howff, under a huge boulder beneath Dividing Buttress. The cliffs around were the site of much prospecting for cairngorm stones and are still of mineralogical interest.

Loch Einich ("marshy"; also, Eanaich or Eunach) was once used as a water supply source for Strathspey and has been noted for containing

charr (photograph 6 below). The loch was once used as a water supply source for Strathspey, hence the dam at its outflow.

6 Loch Einich Ken Thomson

Loch Etchachan (perhaps "boisterous") once had a fishing boat (the mooring ring is still there, at the SW corner), and other boats have been carried up there more recently. In 2012, "Reginald Rat", snorkelling in clear water, reported a water temperature of 11°C, a depth of at least 6m, and a bottom surface of brown and green algae, but no fish. Amongst birds seen here have been mallard, golden-eye, common sandpipers (breeding), sand martin, and a black-throated diver.

Clais Fhearnaig ("hollow of the alders") between Glens Derry and Quoich was dammed in the 1800s – or possibly in 1928 – to create a fishing pool: the trout are still there.

Loch Kander (*Ceann-mor* or "big head(water)") in Glen Callater lies in a corrie with an assemblage of barium-rich minerals [e.g., armenite] "*unique in Britain*". In 1862, a Rear-Admiral Jones, on a botanical

expedition, got stranded for two nights above the loch, and only his geological hammer stuck in the rocks saved him from a nasty end before the search parties arrived.

Lochnagar (the loch) ("goat") has had an entire scientific book (Rose, 2007, *Lochnagar: The Natural History of a Mountain Lake*, Springer) devoted to it and its surroundings (photograph 7 on the following page). Over the last 9,000 years, 1.55m of largely organic debris has accumulated in places on the loch-bed, with the sedimentation rate increasing in the last 150 years, and probably into the future. Fossil pine stumps about 7000 years old occur near the eastern shore of the loch, indicating marked changes in the surrounding vegetation. Water temperatures, and ice-free periods, show increasing trends over recent decades. Acidification increased over the 150 years until about 2000 but is now decreasing. However, the catchment soils contain a large store of pollutants yet to be carried into the loch. At the top of the short food web, trout are scarce, slow-growing and (partly due to atmospheric pollution) in poor body condition. The only other recorded fish species here is the European eel.

Loch Muick (probably "misty") was of course a favourite spot of Queen Victoria, who had Glas-allt Shiel built on its shore in 1868. The loch was the site of an aircraft crash in 1992, when a light aircraft from Aberdeen disappeared from air traffic view. Three weeks after wreckage was identified on the lochside, the aircraft was located in about 50 feet of water some 300m from the SW end of the loch, and the bodies of the two occupants recovered. Trout up to 6lb have been caught in the loch, and larger fish at various depths. Salmon and sea trout are now getting to the loch via the refurbished fish ladder at the Falls of Muick. However, drinking from the loch is not advised, with some 21st century reports of walkers and cyclists developing strains of E. coli and campylobacter. The Pools of Dee have both been reported as containing trout of different sizes, indicating a lack of underwater intercommunication.

Loch an t-Seilich ("willows"; Loch Gaick on some old maps) is the source of a 4½-mile tunnel, completed in July 1940. Built for hydroelectric purposes, it leads to Loch Cuaich. It was once believed to contain a large but mysterious fish called the dorman, which prevented salmon gaining the loch from the river Tromie.

7 Lochnagar Mike Duguid

An Lochan Uaine ("green") on Derry Cairngorm was the site of a turf hut built and used by an eighteenth-century Abernethy poet and deerstalker (or poacher), William Smith.

Lochan Uaine ("green") on Cairntoul has been used to examine the productivity of organic matter as a measure of climatic change over 4000 years, in a situation largely unaffected by human activities. A "*few trout*" were placed here in 1912, but by 1935 had "*never been seen rising, so that it is difficult to tell whether they have survived*".

Loch Vrotachan ("cattle-feeding" or "-fattening"; variously Bhrotachun, Valican, Bhrodichan or Bhrot-choin) near the Cairnwell lies in a fertile basin surrounded by lime-rich schists. It is reported to "*hold the largest trout of the lochs in the region with several 2 lb fish taken every year*". It is used, along with a corrugated iron hut, by a local angling club, who may at one time have constructed a small dam (since breached) at the SW corner.

Loch Wharral, in Glen Clova is "*abundant in good small trout*". In 1964, two youths were drowned here when their canoe capsized; a body was recovered by frogmen.

End Words

The first Honorary President of the Club, the Right Hon. James Bryce DCL MP, managed to author the first-ever article ("Some Stray Thoughts on Mountain Climbing") in the Club's journal in 1893 without a single mention of "loch" (or "lake", "tarn", "water", "burn" or "river" – though he did manage "snow" several times). However, a "Grand Old Man of the Club", Alexander Copland, said in 1890:

"*Even the most unscientific members* [of the Club] *could hardly indulge in the pastime* [of mountain climbing] *without considering and discussing the natural phenomena to be met with – how moraines were formed, how corries were scooped out, how lakes came to be left in the bosoms of the hills.*"

and another respected early writer (Colin B. Philip, in 1910) went so far as to assert that "*Corries that have no tarns are to me always a little disappointing*". This author agrees!

A longer version of this article, with footnotes giving sources and further information, and an Excel database, are available from the author, who would like to thank Alec Macmillan, Roger Owen and his own siblings Alan and Julie for help on certain points. None of these kind people bear any responsibility for the contents above.