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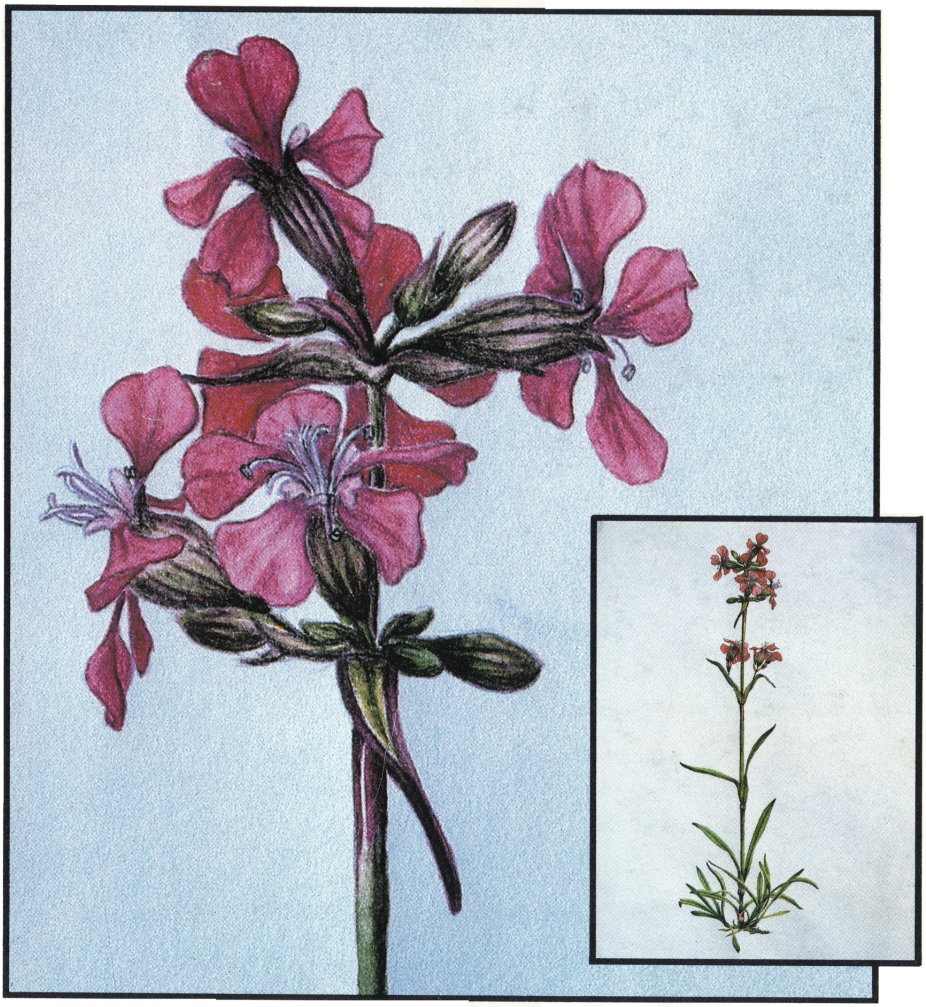

The Sticky Catchfly *Lychnis viscaria* L.
Painting by Angela Heaney

Volume 11

## Volume 11

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# THE SCENERY OF SCOTLAND - THE STRUCTURE BENEATH

W. J. Baird

Royal Museum of Scotland

Although varied and beautiful, the scenery of Scotland is nowhere continental in scale. By this I mean that there are no huge mountains or great areas of monotonous plain. However, having said this, it is widely accepted that in some areas the scenery can be grand and magnificent in the true sense of the words, as in the Torridonian Hills of the far north west. In other areas, such as the hills and sheltered fields of inland Fife, it almost seems a landscape in miniature.

Landscape is sculpted by the action of the weather, and in the recent geological past this also meant the grinding by debris-laden glaciers. These same glaciers left behind in many areas a mantle of debris known as till which can sometimes mask, but not entirely hide, the underlying rocks. The rocks beneath are like good bone structure in an old lady's face. Even in old age they allow the landscape to maintain both beauty and character. Rocks are the skeleton of the landscape and they lay down the limitations and boundaries for its final aspect. The Lewisian rocks of the ancient basement have familiar characters which would allow those who have studied them to be blindfolded, flown three times round the world, and if landed on a landscape of Lewisian rocks to say 'I may not know exactly where I am but these are rocks of the Lewisian'. Each rock type has its own indicator or group of indicators which show through in the landscape. This may be the greenness of the vegetation over limestone or the predominance of heather over granite or a physical indication such as the table-like feature created by the Tertiary basalts.

It is not possible in a short paper to describe all the rock types of Scotland and their effect upon the resulting scenery. If Archibald Geikie took 472 pages in his classic *The Scenery of Scotland* and Sissons took 232 pages on *The Evolution of Scotland's Scenery* and in more recent times Whittow takes 330 pages in his *Geology and Scenery in Scotland* then in such a limited space I will only be able to give a very condensed and simplified introduction.

The geology of Scotland is very complex, and although it lacks certain elements common on the continent such as Tertiary sediments, active volcanoes and glaciers, it is on first acquaintance a formidable mixture of rock types and chronological periods. Fortunately, with some exceptions, it can be broken down into four geographical areas. These are:

1. The North West Highlands and Islands
2. The North and Central Highlands
3. The Central Lowlands
4. The Southern Uplands

1. The North West Highlands and Islands

The basement area of the Outer Hebrides and the Highlands west of the Moine Thrust: this area for convenience should also include the Tertiary volcanics of the Inner Hebrides. Four major rock types each give rise to a significant land form. Lewisian rocks, the oldest in Britain, are a re –exposure of an ancient landscape. Rarely forming hills of more than a few hundred feet high, they produce a knobbly terrain of bare rock knolls between pools of peaty water. The surfaces of the knolls are often rounded by ice and the whole effect is one of a chaotic, yet repetitive, pattern of rock and water.

The Torridonian lies directly upon the Lewisian but is now only a remnant of a once great expanse. The almost horizontally bedded warm red, pebbly sandstones form relict mountains which rise upon their Lewisian foundations like the *ruined* castles of Elfland. No one who has seen the Torridonian mountains will need to be convinced of their special attraction and grandeur. Anyone who has not seen them should do so.

The igneous rocks of this area are of two types. First are the extrusive lavas such as those which create the basalt plateaus of Northern Skye. The second is the unique intrusive Gabbro complex of the Cuillins forming a series of rock ridges and jagged peaks compelling both for mountaineer and photographer.

2. The Northern and Central Highlands

This area, going south to the Highland boundary fault, includes the metamorphic rocks of the Moine and the Dalradian. The area has on its North East margin the Old Red Sandstone of the Orcadian basin and the thin strip of Jurassic rocks on the east coast of Sutherland. Also included are the granite batholiths which colour the geological map red and provide the clear burns for the whisky distilleries. Again we can talk of four main rock types, although none will give rise to such unique features as in the previous area. The predominant surface ornament owes its origin to the metamorphosed sedimentary rocks of the Moine and Dalradian period which were subsequently folded during the Caledonian mountain building era and finally carved and sculpted by glacial ice. It is perhaps sufficient to say that even a landscape enthusiast such as I find the flaggy quartzites of the Moine occasionally boring whereas the more varied geology in the Dalradian provides a rare seasoning of Limestone schists which can make an alpine garden of a Perthshire mountain.

Overlying the eastern and northern edge of the eroded Caledonian fold belt are the sedimentary rocks of the Old Red Sandstone and the Jurassic. The flaggy sandstones of Caithness and the Orkney islands are the uplifted freshwater sediments from the bed of 'Lake Orcadie'. Inland they form low rolling hills but on the sea coast they created spectacular cliffs and other extraordinary erosional phenomena such as geos, gloups and sea stacks.

The Jurassic sediments are coastal marine in origin and of very limited

exposure on the east coast. Best seen between Golspie and Helmsdale, it is possible to find here the remains of ancient coral reefs and to stand facing the sea as it was in Jurassic times. In the mind's eye Ichthyosaurs leap from the warm ocean while Dinosaurs roar in the dense jungle behind.

From scenes such as these we change in an instant to the Arctic plateau of the Cairngorms. This granite batholith was intruded at depth into the surrounding rocks during Devonian times and as the overlying rocks became eroded, it gradually became the granite massif we see today. The rock, although a source of treasured crystal, is poor in nutrients and its high average height produces winter snowfields and weather as though it were 1000 Km further North. A combination of steep sided corries, glaciated valleys and rounded surface plateaus with occasional Tors, can give the Cairngorms an interesting but innocuous look during good weather. It is as well to remember however that the scale of the mountains is greater than anywhere else in Britain and the weather changes can be sudden and threatening.3. The Central Lowlands

South of the Highland boundary fault in the Central Lowlands lies the biggest concentration of the economically valuable rocks. Carboniferous in age these rocks have been mined and quarried for centuries. It is really only in the Central Lowlands that the hand of modern man can be said to play a major part in the shaping of the landscape. If we visualize the Central Lowlands as a trough which was gradually infilled by debris derived from higher areas to north and south, then intruded and overlain by volcanic episodes, a simplified picture of its origin begins to appear. Mainly appearing at the surface on the north of the trough are the conglomerates and sandstones of the Old Red Sandstone. Rich in iron, they colour the fertile fields of Tayside and Angus a dark red.

In Carboniferous times, shallow seas and great deltas laid down a cornucopia of rock types which gave rise to the wealth of the region and to the concentrated effect of man upon its scenery. Limestone and coal, oil shale and ironstone, sandstone and clay, they have been mined, quarried, processed and dumped until the landscape has been altered so much that we are no longer aware of its original face. In some cases, such as the burnt oil shale heaps, the residues themselves have become part of the new landscape.

There are numerous complex and varied volcanic features in the central belt ranging in age from Old Red Sandstone to Permian and in size from the Ochil Hills to single volcanic necks such as the Bass Rock. The relationship of these rocks to their surroundings is often further complicated by faulting and subsequent glacial activity. The scenery associated with the Ochils fault, for example, is a combination of volcanic activity, sedimentary rocks, faulting, glacial action, erosion and deposition of alluvial fans, subsequently built on by man. The difficulty of interpreting such a complex sequence can be readily understood.

4. The Southern Uplands

The Southern Uplands fault delineates a band of low hills that run to the English border. Mainly of Silurian and Ordovician sedimentary rocks, this area too is complicated by inliers of Carboniferous, New Red Sandstone and the intrusion of the major granite masses of Criffel and Loch Doon. To the superficial observer the repetitive green hills of the Southern Uplands may look like the waves on a green ocean rolling ever southwards to crash at last on the Northern bastions of England. However, to the Borderer and keen observer alike they are as varied as the geology. On the rocky coast at Ballantrae, great lava pillows are piled on the cliffs looking as fresh as they did millions of years ago. On the Berwickshire coast the intense folding of thie rocks is shown in the magnificent cliff exposures of Fast Castle and Heathery Carr. In between are rounded hills and deep valleys as potent: in the ability to free the spirit as any mountain top in Glencoe. Glacial action has here had a more rounding action than anywhere else in Scotlaand, culminating in such classic features as the Devil's Beeftub and B-road Law. Although the predominant rocks are of the lower palaeozoic the granite masses of the south west give a sense of being back in the Northern Highlands. Small in extent, but unique in character, the new red sandstone rocks are petrified sand dunes now supporting green jgrass and dairy cows.

5. Distinctive Features

This is a vastly over-simplified breakdown of the geological foundations of Scotland, but it provides the observer with a basis on which to add more detailed observations. For instance, the many volcanic dykes which transgress the various rock types can be picked out as ridges or gullies depending on their hardness relative to that of the rock through which they pass. Small areas of ultrabasic rocks give bright spots of green, which is not that of limestone, but the 'Achadh uainee', the green field, of the crofter. Faults such as the Great Glen traverse the landscape creating boundaries and pathways, while mineral veins s show up as streaks and slashes depending on whether they are barrel n quartz or have already been mined for their ore. Each area is unique and varied: its differences outweighing the similarities. For those who would let the rocks explain, the scenery will be a never-ending wonder.

6. Conservation Matters

The conservation of the landscape is a subject guaranteed to raise friction and controversy, but we can be sure that the pock-marked outer skin can be relied upon to be man's work wherever it has been within his ability and remit to do so; however, the subcutaneous

layers, the flesh and muscles are all the province of the rocks beneath. I feel therefore that it is incumbent upon all those who are responsible for changing the face of our landscape to have at least a basic knowledge of its anatomy and skeletal framework. This applies not only to miners and quarrymen but much more widely to farmers and foresters, to civil engineers and hydrologists, sewage and rubbish disposal operatives, and last and perhaps most important of all, the general public. After all it is in their name and often with public money that projects which will alter the landscape are funded. Changes to the landscape tend to be permanent, at least on the human scale of time, so they should not be carried out thoughtlessly or carelessly. This is the only earth we will ever stand on and although it can be given a face lift, it can never be traded in for a new model.

While man now has the power to damage and even destroy a landscape he has only the gardener's ability to create one. However, Scottish landscape is of such quality and variety that there still exists a multitude of beautiful scenes from coast to coast and roadside to mountain top. Neither an open book nor an unfathomable mystery, its genesis can easily be understood by those who hold the key to its third dimension; the structure beneath.

## ACKNOWLEDGMENTS

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Text by W.J. Baird, Department of Geology, Royal Museum of Scotland.

Illustrations are based on designs for the Highland Boundary Fault Trail at David Marshall Lodge, Aberfoyle by Alan Chalmers, Forestry Commission, Design and Interpretation Branch.

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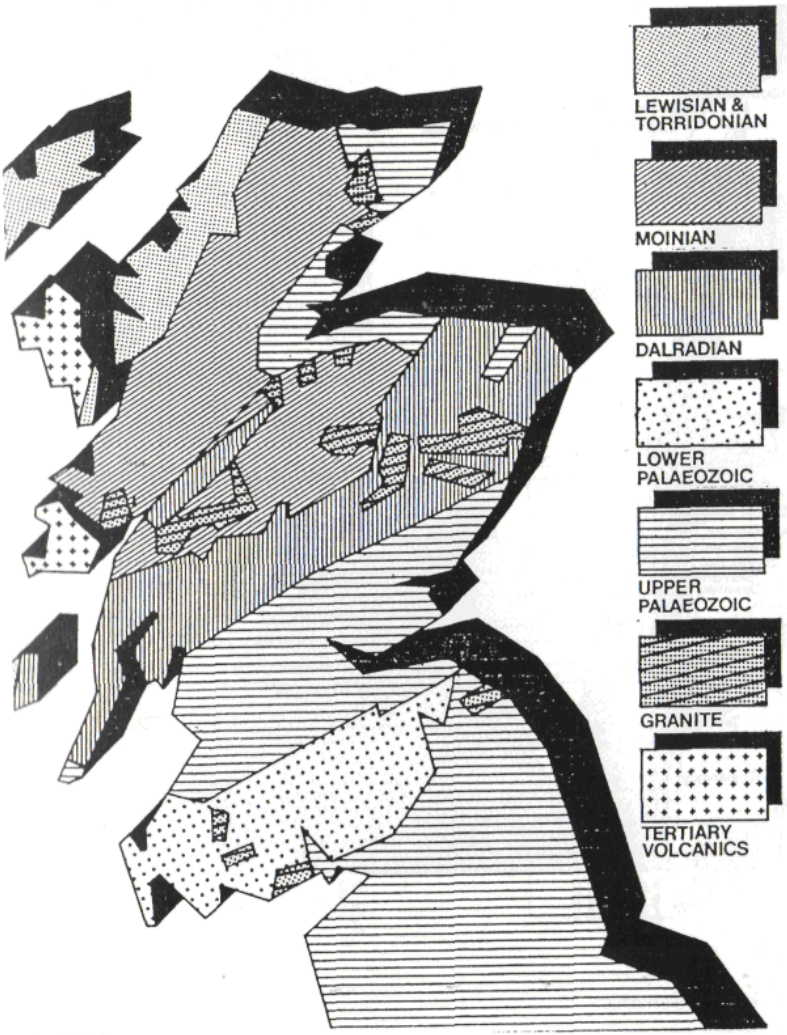
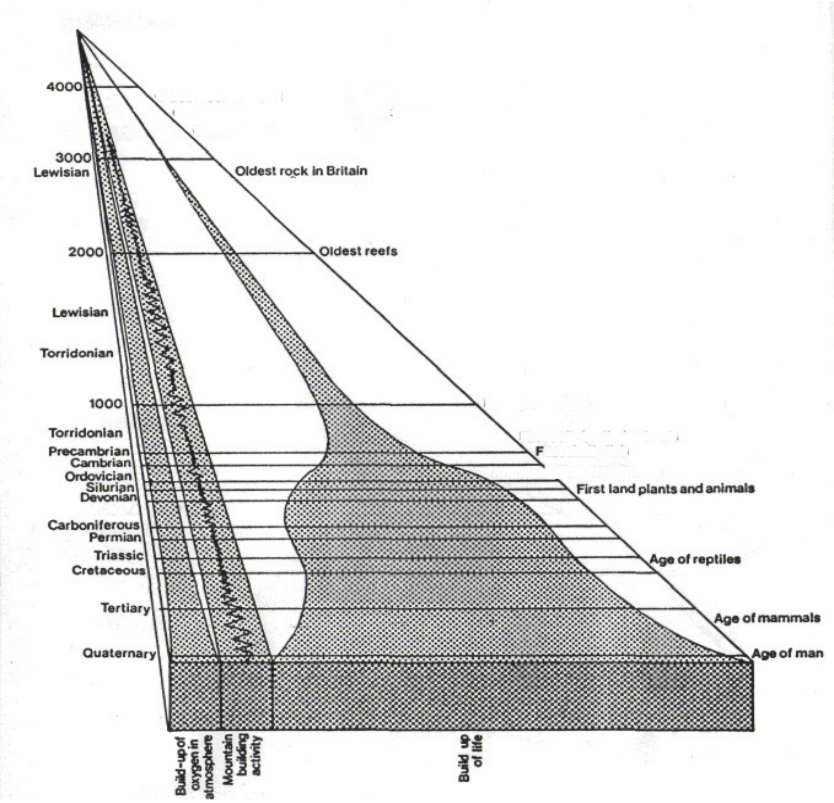



Figure 1 Simplied Geology of Scotland




Geology is dynamic

It may seem that the landscape has never altered and never will. But the processes of geology began with the formation of the Earth and will continue until its end. Every stream is gradually wearing and rounding the rocks it carries in it. In times of flood its powers are greatly increased and it carries a larger load down towards the sea. Each stream is contributing in its small way to the geological processes that affect our whole planet. In comparison with these activities, human existence is momentary; what seems to us as unchanging is in fact a continuing process of evolution.

Figure 2. Geological Time-scale.

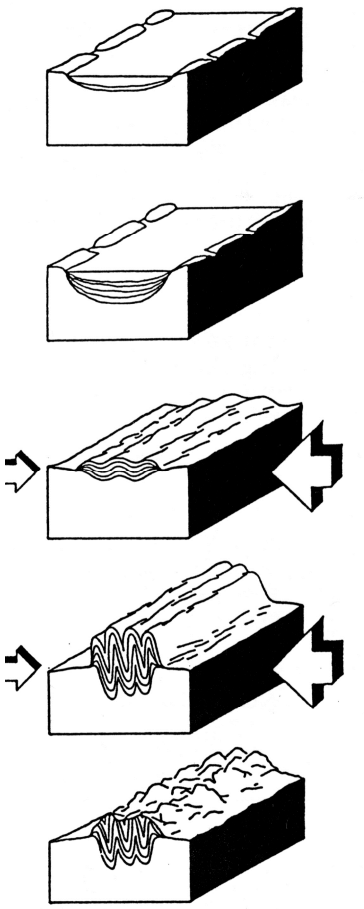
Sediments are laid down in layers often thousands of feet thick. As the land sinks more layers continue to be deposited on lop, and the deposits get buried deeper and deeper.

The weight above causes extreme pressure so that water is squeezed out .ind the soft material left is cemented into solid rock. When sedimentary rocks are subjected to immense pressures and heat I hey are altered into metamorphic rocks which are usually harder than the original sediments.

During a period of mountain building the forces near the Earth's surface are powerful beyond imagination. The rocks .ire pushed and squashed from different directions and begin to rise and fold.

The rocks become altered in the process how much they alter depends on the strength of the pressures and temperatures. In the Highlands the rocks .ire more altered (and older) as you go north.

The folding which occurs can then be eroded by the effects of glaciation and weathering. Erosion causes changes in shape and wears through to different rocks and features below the surface.



At present powerful Earth surface forces are at work in the earthquake and volcano zones of western America, 50-60 million years ago it was happening in the Alps and Himalayas, some 500 million years ago it was happening here.

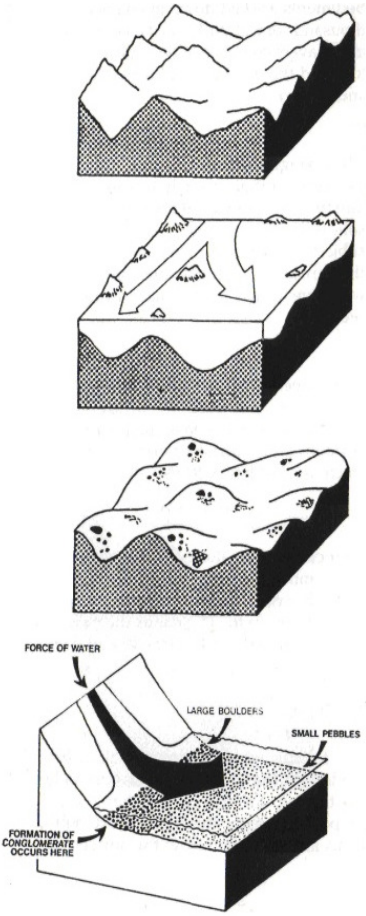
Figure 3. The Active Earth.

ICE SHAPES THE LAND

Between 500 and 400 million years ago massive land movements squashed and heated the rocks forming the mountains of the Highlands (Caledonian orogeny). Weathering began as soon as the mountains were formed but the shapes we see today are mainly the work of the last ice age.

For 100,000 years until 12,000 years ago the Highlands were covered by a thick sheet of ice which, as it slowly moved, smoothed and rounded the mountains.

As the ice melted, the rocks and stones it was carrying dropped out and can now be seen scattered on hillsides and in valleys.




CONGLOMERATE

or Puddingstone'

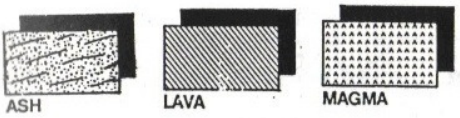
Formed from a mixture of sand, pebbles and boulders which were carried by the force of water down hill by mountain streams in an ancient landscape.

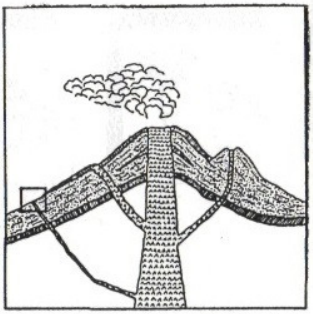
As the speed of the water decreased with the change in the slope so its carrying capacity dropped. This resulted in the larger boulders being dropped, while smaller pebbles were carried on until they also were too heavy for the carrying capacity of the water. The larger pebbles and boulders were eventually cemented together to form a rock known as Conglomerate.

Figure 4 Ice shapes the land and conglomerate formation

VOLCANIC ACTIVITY

All Scotland's volcanoes are now extinct but they have left features in the landscape which tell of their fiery origins.



Formation of a dyke.

The illustrations show the formation of a dyke. Molten rock from the Earth's interior has pushed up through a line of weakness in the Earth's crust. Then the rocks through which the dyke has pushed have been eroded away leaving the dyke exposed.

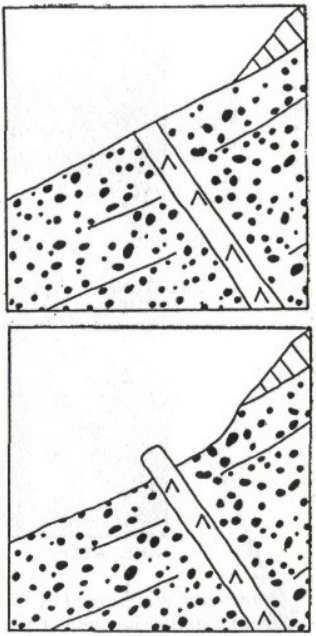
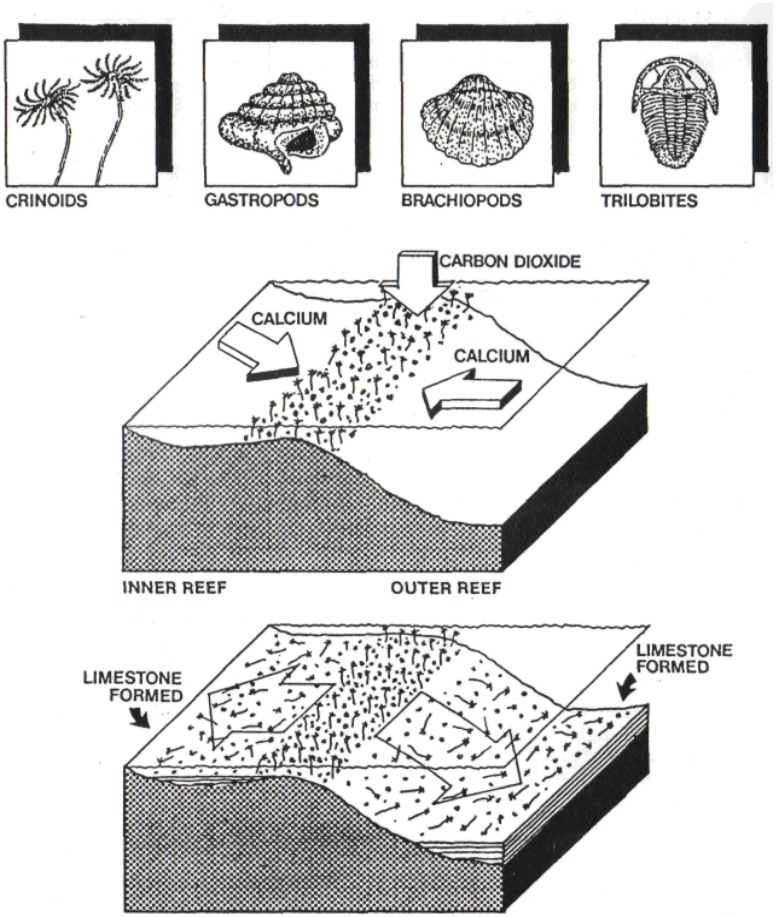


Figure 5 Volcanic activity and dyke formation.

EXAMPLES OF SEA CREATURES AND FORMATION OF LIMESTONE




INNER REEF OUTER REEF

Limestone was formed by the shells of small sea creatures, These creatures often lived together in a reef. They took dissolved calcium from sea water and carbon dioxide from the air for the materials of their shells. After they died their shells dropped to the bottom and would be washed either to the inner or outer reef.

Figure 6. Limestone Formation.

**How slate is formed….**

Layers of clay are buried deep within the earth, where they become compressed and harden.

Pressure from the sides causes the layers to buckle and fold. The pressure begins to recrystallise the clay minerals.

When the layers have folded, the clay minerals have all recrystallised. The crystals, mainly mica (which is a shiny flaky mineral), lie parallel to each other and at right angles to the direction of pressure.

It is along these planes of mica that slate r,i n be split and this often gives slate a glistening surface

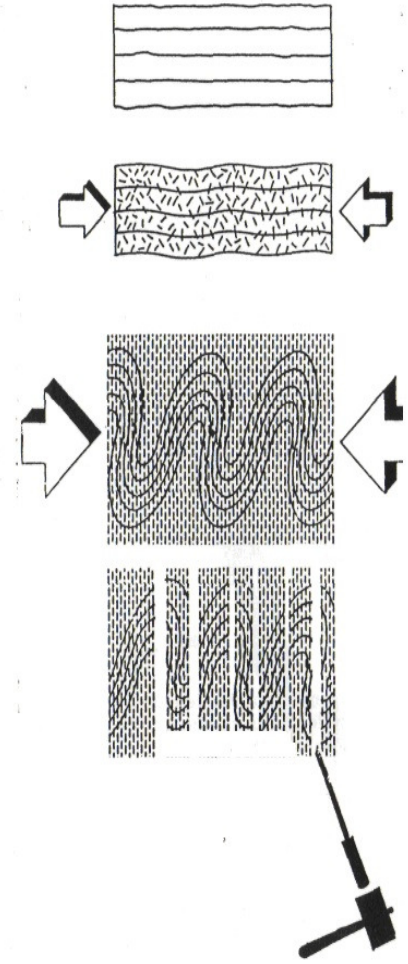


Figure 7. How slate is formed.

An unconformity original rock formation.

After the initial rock formation we know that the rocks were tilted on their side. Layers that were once horizontal were then vertical. After the rocks tilted the newly exposed surfaces were eroded.

of younger rocks occurred on the eroded surfaces resulting in an 'unconformity'! The type of unconformity illustrated is an angular one.

Again the newly deposited rocks were eroded and uplifted to expose the unconformity.

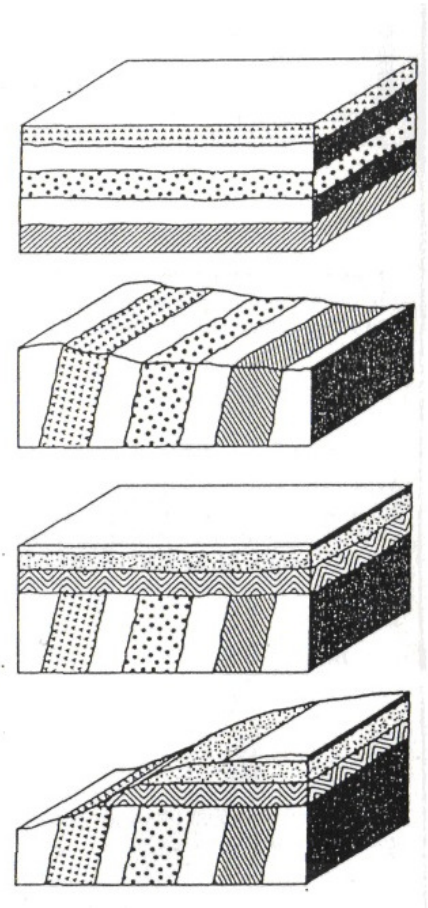


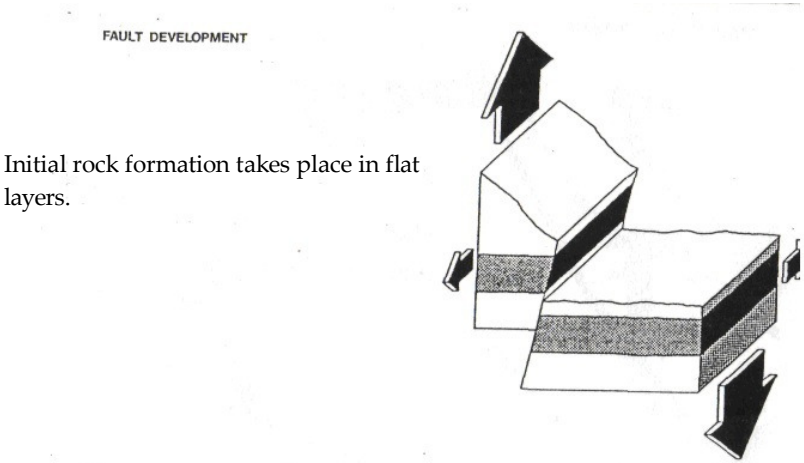
Figure 8 An unconformity initial rock formation

MAJOR FAULT MAP MOINE THRUST FAULT


The map shows four major faults along which movement has taken place.

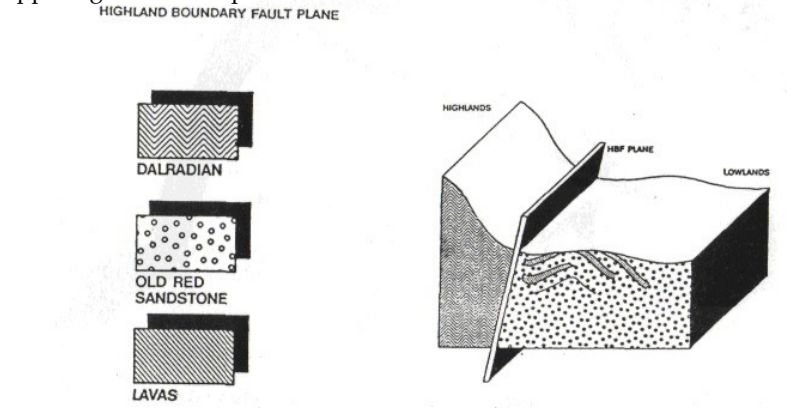
The Highland Boundary Fault is hundreds of miles long stretching under the sea off the east and west Scottish coasts, showing that the movements were on a truly enormous scale.

Figure 9 Major fault map of Scotland




Initial rock formation takes place in flat layers.

Along weak lines in the Earth's crust fractures take place which allow blocks of rock to move against each other. Some faults allow movement in a sideways direction whilst others cause one block to push upwards and the opposing block to be pushed down.




The Highland Boundary Fault forms the Northern margin of the Midland valley. The Southern Uplands Fault forms the Southern boundary. The Midland valley has dropped down between the rocks of the Highlands and Southern uplands.

Figure 10 Fault development and Highland Boundary Fault plane

# ANNUAL CLIMATOLOGICAL BULLETIN NO. 8, 1986

S. J. Harrison
University of Stirling

## THE WEATHER OF 1986

Temperature *and rainfall values referred to in the following relate to Stirling (Parkhead) unless otherwise stated.*

The year began with temperatures well below normal during February and through spring. The summer though drier than 1985 was cold and not particularly pleasant. Frosts in September brought an early end to the growing season, especially in low-lying and sheltered areas, but were followed by a very long and mild autumn.

### January. Cold damp and windy.

A deep depression filled as it moved across the British Isles on the 1st and 2nd and was followed by a weak ridge of high presure under which air temperatures fell away very quickly. Fronts brought snow during the evening of the 4th, which accumulated to lOcms or more on low ground. As pressure increased from the north-east, the weather became cold and grey until the 9th when more fronts brought in milder air from the Atlantic. A deep depression to the north of Scotland on the 9th, 10th and llth brought very strong winds, the heaviest rain of the month (20.8mm registered for the 9th) and local floods. The wind remained strong until the 15th, which was pleasantly sunny, as a ridge of high pressure moved slowly eastwards across Scotland. However, under clearer skies, and with air coming from a more northerly direction, night-time temperatures fell very markedly. More unsettled weather with strong winds and snow returned on the 18th and persisted until the 24th when a ridge extended northwards in the eastern Atlantic bringing Scotland into a cold and clear northerly air-stream. As a warm front moved eastwards on the 26th drizzle fell onto cold ground (air minimum -5.2°C) resulting in severe surface icing. While pressure remained generally high to the west, low pressure and associated weak fronts ensured a cold and damp end to the month, with snowy conditions on hill roads.

### February. Very cold but dry.

The most remarkable feature of this month was the recording of 23 air frosts at Parkhead and a 'full-house' of 28 at Carim. For all of the month, the British Isles were sandwiched between extensive areas of high

pressure to the north and low pressure to the south. This brought in a strong easterly airstream which originated in the cold Russian interior. Central Scotland did, however, escape the worst of the snow and severe frosts which afflicted England. The weather for the first four days was dominated by a raw north-easterly wind. Skies were overcast and light rain fell on the 2nd. A cold front crossing Scotland from the east during the afternoon of the 5th brought the first snow, which drifted in a strong easterly wind on the 6th. High pressure extended southwards across Scotland on the 9th but, although the wind dropped, the weather remained dull. The anticyclone moved eastwards into the Baltic on the 10th where it remained until the 13th when it extended north-westwards across Sweden and Norway. The night-time temperature on the 13th fell to the month's lowest at -7.4°C. The rest of the month was generally cloudy with occasional snow showers. When skies cleared a little after the 21st night-time temperature fell sharply.

March. Cold and unsettled.

The previous month's cold weather continued for the first three days although the pressure patterns were changing as high pressure extended north-eastwards across Britain. Minimum temperatures fell to -9.1°C and -9.2° C on the 2nd and 3rd under clear skies. A strong westerly airstream and active fronts arrived late on the 3rd bringing unsettled but much milder weather for the following week. By the llth, high pressure became established over Europe which brought a very mild south-south westerly airstream over Britain until the 18th. The month's highest air temperature of 11.7°C occurred on the 15th (8.0°C at Carim). A deep depression crossed to the north of Scotland on the 20th resulting in a remarkable rate of fall in pressure. Heavy rain (snow on high ground) and a westerly gale caused considerable problems on Scotland's roads. As high pressure became established to the south-west of Britain on the 21st heavy showers of rain and sleet fell in a strong westerly wind which reached storm force in England and Wales on the 24th. The weather remained unsettled for the rest of the month. Temperatures began to fall again and snow showers returned by the 31st as high pressure extending northwards in the Atlantic resulted in cold arctic air affecting Britain.

April. Cold and generally dull.

Over the first seven days, the weather was dominated by high pressure which moved from the west to the north of Scotland. Cloud amounts were relatively slight which gave not only bright sunny days but also moderate night frosts. Winds were generally light north-westerly but by the 6th had begun to freshen from the north-east. This brought snow showers which were sufficiently heavy on the 6th and 7th to lie briefly. Complex fronts associated with low pressure over continental Europe brought heavy snow

to England on the 8th. As the low moved away eastwards pressure began to build again to the west of Scotland and for three days the weather was dull and cold in a fresh northerly wind. On the 12th a complex low began to develop off north-west Scotland, which deepened until the 15th and 16th, which were cold, wet and windy. The 15th was the wettest day of the month (14.4mm). The low filled as it drifted eastwards and was replaced by a weak ridge of high pressure, which cleared the sky and brought night frost on the 17th/18th. For the remainder of the month, pressure was high to the south and west of the British Isles, which experienced unsettled cold wet weather with some sunny intervals. More than 12.5mm of rain fell on the 19th (25.5mm at Carim) and 22nd. When night skies cleared, air temperatures fell to give occasional slight frosts.

May. Unsettled and very wet.

Dry days were rare during what was the wettest May since records began at the University in 1970. While pressure remained high to the east of Scotland the 1st and 2nd were pleasantly warm and sunny, the latter being the warmest day of the month (18.8°C, Carim 15.1°C). However, as a shallow depression began to deepen and drift northwards during the afternoon of the 2nd, thundery rain arrived by the early evening. While the low remained in the vicinity of Ireland the weather was dull and wet until the 7th, with the exception of the 6th which was a little brighter. By the 8th more vigorous Atlantic systems had taken over, bringing rain and, at times, strong south-westerly winds. 13.7mm of rain fell overnight on the 9th/10th (23.0 mm at Carim). A weak ridge of high pressure moved north-eastwards across Britain on the 15th and 16th, which were fine sunny days. However, a deep low with associated fronts brought heavy continuous rain in a very strong south-westerly wind late on the 17th (16.7mm, 22.5mm at Carim). Pressure increased briefly from the east on the 19th and 20th which were mild, generally dull, days but a deep low moving to the south-east of Ireland heralded a return to wet and windy weather for the next seven days. Pressure increased from the south-west on the 28th to end the run of wet days, but rain returned late on the 30th as a warm front crossed Scotland.

June. Unsettled at first, becoming warmer.

Pressure remained high to the south-west of Britain for the first three days, and weak troughs with light rain moved south-eastwards across Scotland. A ridge extended northwards across Ireland on the 4th bringing cool, clear, sunny weather until the 8th when more unsettled weather returned. A low over Scotland on the 10th was associated with continuous rain while *snow* affected hill roads. Pressure began to increase from the south-east on the 12th but didn't improve the weather locally,until the 13th and 14th which were warm but humid. The skies cleared on the 15th and 16th which were

hot and sunny. A shallow low moved eastwards across Scotland on the 16th bringing heavy rain in the evening and the month's wettest day on the 17th (17.4mm, 16.5mm at Carim). Pressure began to rise to the north of Scotland on the 19th but skies remained cloudy until the afternoon of the 20th. The 21st and 22nd were pleasantly sunny but skies clouded over again as a shallow low moved over Britain on the 23rd. The 24th was dull with drizzle for most of the day. A broad area of high pressure became established over the North Sea on the 25th and the weather became hot and dry, although cloudy at times. The summer's highest air temperature (26.0°C) was reached on the 28th (23.2°C at Carim).

July. Warm at first, becoming more unsettled.

Pressure remained high for the first two days and the weather continued warm and sunny. As pressure fell, weak fronts brought cloud and occasional rain after the 2nd. By the 7th, with low pressure over Scandinavia and high pressure to the south-west, Britain was brought into a cool north-westerly airstream for three days. Rain spread south-eastwards on the 10th but amounts in Scotland were small. High pressure extended across Britain on the llth to bring three dry but cloudy days followed by rain late on the 13th. As the high extended into continental Europe on the 15th and 16th the weather became unpleasantly warm and humid. A deepening depression crossed to the north-west of Scotland on the 16th and 17th bringing a freshening wind and light showers. High pressure embraced Britain on the 18th which was sunny, but it slipped away south-westwards to bring in a cool showery north-westerly airsream for the next four days. By the 24th, control of the weather was returned to Atlantic systems which brought windy and wet conditions for much of the remainder of the month. The 28th and 30th were very wet days, the former being the month's wettest with 15.4mm (29.5mm at Carim).

August. Cool with rain at times.

A deep depression moved from the south-west on the 1st bringing very strong winds and rain over the first two days. Skies cleared on the 3rd as pressure increased but another deepening low crossed Britain on the 6th bringing yet more stormy weather. Heavy showers fell in its wake on the 7th but by the 8th a ridge of high pressure had become established which kept the weather sunny and warm for five days. The temperature just managed to reach 20.0°C on the 12th, the month's warmest day. Another deep depression tracked slowly east across Scotland between the 13th and 15th which were again wet and windy. 10.6mm fell on the 15th, the wettest day of the month. As pressure increased on the 16th the weather became warm and dry until the 20th. The next in a seemingly endless queue of depressions

approached from the west on the 21st bringing a return to less settled weather, which began to clear late on lthe 22nd. The 23rd and 24th were bright clear days, the night temperature on the 23rd falling to 3.2 °C (2.8°C at Carim). Gales, very heavy rain and floods were associated with a deep low which tracked across England on I ho 25th but central and northern Scotland escaped with little more than a fresh to strong easterly wind. By the 27th the low was over the North Sea filling as it drifted very slowly eastwards. With pressure high in the west, Britain was brought into a cool northerly airstream resulting in a night minimum of 1.1°C on the 30th/31st. Pressure began ID I.ill on the 31st as fronts associated with a depression to the north of Iceland began to move in from the west.

September. Dry, very cold at times.

A depression crossed Britain on the 2nd bringing continuous heavy r.iin late in the afternoon (19.3mm). Pressure began to rise on the 3rd .UK! the weather remained dry and bright until late on the 5th when a wc.ik cold front moved southwards across Scotland. High pressure U Y.I me established off north-west Scotland by the 8th, which dominated I lie weather until the 16th. Under almost cloudless skies, days were pleasantly sunny but night temperatures fell very sharply, the first frost of the season occurring on the 10th (-0.6°C, -2.3°C at Carim). As Complex areas of low pressure approached from the north-east and south-west on the 13th the weather in southern England and Wales became very wet but pressure remained relatively high over Scotland and night temperatures continued to fall. By the 16th the anticyclone had begun lo drift southwards to lie over southern England by the 20th. Night temperatures reached their lowest on the 18th (-3.2°C, -1.2°C at Carim) ,ilter which the wind began to freshen from the west and cloud amounts increased. The weather remained milder in a fresh but relatiely dry westerly airstream until the 23rd when pressure began to increase over Scotland. The next three days were hazy but tended to clear in afternoons. Fronts approached Scotland early on the 26th bringing three very dull and wet days. As pressure began to rise quickly on the 29th, the weather became relatively calm and the 30th was unseasonally hot in eastern Scotland. The mean minimum temperatures for the University (4.8°C) and Carim (4.7°C) indicate very clearly the controlling effect of topography under anticyclonic conditions. Lower-lying and sheltered ground experience, in general, the most severe frosts as cold air drains katabatically (see Notes 4 and 5).

October. Relatively mild; very wet later.

Moderate rain fell as a cold front moved slowly south-eastwards. Across Scotland on the 1st. High pressure with drier sunny weather

extended northwards to cover Britain on the 2nd but drifted eastwards on the 3rd. Light over-night rain fell on the 3rd as a weak warm front moved north-eastwards across Scotland and the morning of the 4th was misty and cool. Rain fell on the 5th and 6th but the 7th was a dry cool day under a ridge which slipped away south-eastwards on the 8th as a front brought in dull wet weather. Pressure increased from the south-west on the 10th and by the llth a ridge had extended over Britain. This drifted slowly eastwards but continued to block the eastwards passage of Atlantic systems which had to wait until the 14th before returning rain to Scotland, albeit briefly. High pressure lay over Britain again on the 15th and 16th which were dry, but as this drifted eastwards Atlantic systems returned and the weather over the next five days was unsettled. Pressure increased briefly on the 23rd which was a cold clear day (minimum 0.7°C, 0.0°C at Carim). A deep depression moved north-eastwards on the 24th, crossing Scotland on the 25th. Both days were wet and windy. The weather improved briefly in its wake but further continuous rain returned on the 27th and 28th as fronts crossed Scotland. Another deep depression moved to the north of Scotland on the 29th and 30th which brought very heavy rain (22.8mm) and exceptionally strong winds which exceeded 150 mph on Cairngorm.

November. Mild and very wet.

Rain was recorded on 27 days and, along with much of western Scotland, the month's total fall was *50* per cent above average. However, winds were generally south-westerly or westerly which kept air temperatures on the mild side. A ridge of high pressure drifted eastwards across Britain on the 1st and 2nd which reduced night termperatures to below freezing. However, a weak occlusion brought rain late on the 2nd, which continued into the 3rd, to be followed by a showery westerly airstream. Further fronts brought periods of rain over the next four days and on the 8th there were heavy showers of sleet and hail. A deep depression approached from the west on the 9th bringing gales and very heavy rain (22.8mm) until mid-day on the 10th. In its wake the llth and 12th were relatively calm, cold and dull days but the wind began to freshen again on the 13th as another depression approached. A vigorous Atlantic system brought further heavy rain and strong wind on the 16th and the River Allan overtopped its banks. Rain spells, some of which were prolonged, followed until the 20th when pressure gradients became very weak and skies tended to clear. Temperatures fell very quickly and freezing fog persisted for most of the 21st after a night minimum of -6.2°C (-5.8°C at Carim). Mid-day temperatures failed to exceed 0°C in many places. A vigorous depression and associated fronts moved in quickly from the west clearing the tog and raising the temperature in the late afternoon. The wind became strong, and heavy rain fell overnight. Another deep depression approached late on the 23rd moving to be off northern Scotland by the 24th. Rain was very heavy

(29.4mm for 24th) and the River Allan overtopped its banks again. The weather remained cloudy and unsettled for the remainder of the month with only rare glimpses of the sun.

December. Wet and windy at first, becoming cold.

The weather during the first three weeks was dominated by a succession of vigorous depressions and associated fronts which brought heavy rain, but temperatures remained a little above average while winds remained in the south-west or west. The 2nd and 4th were exceptionally wet days with 21.4mm and 29.8mm respectively. Weak ridges of high pressure cleared the skies and reduced night temperatures on the 6th and 9th, giving patches of black ice in places. Temperatures began to drift downwards behind a cold front which crossed Scotland on the 13th and precipitation tended to become more showery, of sleet or hail on low ground. By the 19th, temperatures had fallen sufficiently to bring intermittent moderate snow all day. As pressure began to increase to the west of Ireland the winds went round to a more northerly direction <md skies cleared. The 20th to 24th were very cold, temperatures falling to -3.0°C overnight on the 23rd/24th (-2.1°C at Carim). The wet snow of the 19th froze in solid sheets over roads and pavements, most of the latter remaining untreated which resulted in many pedestrian casualties. As high pressure slipped away southwards on the 24th Atlantic systems returned and the weather changed dramatically early in the morning in .1 mild south westerly wind. By Christmas morning most of the frozen snow had thawed and the next few days saw a gradual improvement in temperature although conditions were generally dull and wet. The weather became cooler on the 30th as the wind went round to the south-cast. Heavy rainfall on the 30th and 31st brought severe flooding to mid-and north-Wales.

The last two months of 1986 were exceptionally wet in western Britain, being as much as 250 per cent of average. Here in Stirling the figure was high but only 159 per cent of average.

## DATA SOURCES

Stirling (Parkhead) Grid Reference: NS 815 969

Height above sea-level: 35 metres Established: 1970

Monthly returns of daily observations are submitted to the Meteorological Office and the Climatological Observers' Link. Data are published occasionally in the *Journal of Meteorology.* Missing temperature data are estimated using observations from Westerlea Drive, Bridge of Allan.

Ochil Hills (Carim) Grid Reference: NN 864 049

Height above sea-level: 332 metres Established: 1980

Location: The upper catchment of the Burn of Ogilvie near to the ruined Carim Lodge. Surrounded by open moorland. Autographic recording station visited on Mondays. It was badly affected by snow and ice during January and February and some data were lost. The autographic raingauge performed very badly for most of the year and yielded very little useful data. During the summer the ground-level gauge began to collect less rain than the standard gauge. The reason for this reversal is as yet unknown. The Autographic Weather Station was out of commission for the period July to November and when reinstated was fitted with a new relative humidity/temperature sensor.

CLIMATOLOGICAL AVERAGES

Climatological averages are usually calculated for periods of 30 years (temperature) or 35 years (rainfall). As there are only 16 years of records for Stirling (Parkhead) and 6 for Ochil Hills (Carim), the averages published in Tables 5 and 6 should be used with caution.

INDEX TO FOLLOWING TABLES:



NOTES

1 Climatic Hazards Unit

This Unit was officially established within the Department of Environmental Science at Stirling as from October 1st 1986. Directed by Dr S. J. Harrison and Professor K. Smith, the Unit has two principal functions. The first is concerned with quantifying the adverse effects of weather and climate on socio-economic activities in the United Kingdom and demonstrating the benefits of improved atmospheric information. Secondly, the Unit offers a consultancy service to all those weather-sensitive enterprises which wish to alleviate the losses associated with severe, and maybe localised, spells of weather.

Work has already begun. Professor Smith is currently advising British Rail about the impact of winter weather on railway operations in Scotland, and was a member of the working group set up to monitor conditions during the

1985-86 winter A report has been presented to the ScotRail executive. In November Professor Smith was awarded a £4,600 research contract by General Accident to support a 3-month feasibility study of weather-related insurance claims. This project, due for completion at the end of January 1987, is designed to produce preliminary statistical linkages between different types of severe weather and the frequency of insurance claims in different parts of the United Kingdom.

2 Chernobyl

One of the most newsworthy environmental events of 1986 was the accident at Chernobyl nuclear power station in the USSR in late April. The resulting cloud of radio-active material dispersed slowly during the following weeks to affect many parts of western Europe. The most important lesson to be learnt, ourwith the handling of nuclear technology, is how effective the lower atmosphere is in dispersing pollutants, the deposition of which could, in this case, be readily monitored. The changing synoptic weather patterns which brought the material to Britain were clear several days before its arrival. With high pressure moving into Scandinavia, winds backed from southerly to easterly and by the 2nd provided a suitable air trajectory. In addition to this, a shallow depression lying over Wales and south-west England, and its associated fronts, brought dull wet weather with low cloud, (see Figure 3). Although rainfall amounts were relatively small, this provided the conditions for the washing out of contaminated material from the lower atmosphere, particularly on higher ground, much of which was shrouded in cloud.

3 Bridge of Allan Floods

The River Allan overtopped its banks on several occasions during 1986. An investigation currently under way would appear to suggest that there has been an increase in flood frequency since 1970, which is probably due to a significant increase in the magnitude and frequency of heavy rainfalls during autumn and winter.

ROWLING, Philippa The Flood Hazard in Bridge of Allan (Provisional title). Undergraduate Dissertation (in preparation).

4 The 1986 Growing Season

1986 was notable for having a relatively short growing season which was terminated prematurely by early frosts in September. The term 'growing season' is in itself very difficult to define because there are, in plants, widely differing responses to temperature. It may be defined in terms of numbers of days with a mean air temperature (1.2m above the ground) greater than 6°C, or in terms of the interval of time between the last 'killing' frost of spring and the first 'killing' frost of autumn. A spring minimum air temperature of less than 0.0°C is regarded as being sufficiently cold to

result in damage to young sensitive plants near to the ground surface which may be as much as 5°C cooler than the air at 1.2m. The first killing frost of autumn is more difficult to define as plants are generally taller and more frost resistant. From experience it would appear that with the most sensitive garden plants an air temperature of -2.0°C or less results in extensive, and usually terminal, damage. This is close to the figure of -2.2°C which is commonly used as a threshold of frost damage to soft fruits. In the table the short length of the 1986 growing season can be seen in relation to other years. Although the last spring frost occurred in April, which is slightly earlier than usual, the first frost was 50 days earlier than average. The September frosts in 1986 were most severe in low lying areas. Very sensitive plants such as runner-beans were extensively damaged in lower but not in upper Bridge of Allan, little more than 50m above the valley floor.

Note 4 Table Dates of spring and autumn frosts recorded at Stirling (Parkhead) climatological station between 1971 and 1986.

| Year | Last Frost 0.0°C | First Frost 0.0°C | First Killing Frost -2.0°C | Growing Season (days) |
|---|---|---|---|---|
| 1971 | 29 April | 13 October | 13 October | 167 |
| 1972 | 23 April | 8 September | 14 November | 205 |
| 1973 | 2 May | 11 October | 26 November | 208 |
| 1974 | 5 May | 28 September | 7 November | 186 |
| 1975 | 3 June | 27 September | 21 November | 171 |
| 1976 | 28 April | 31 October | 13 November | 199 |
| 1977 | 15 April | 17 November | 21 November | 220 |
| 1978 | 15 April | 25 November | 27 November | 226 |
| 1979 | 6 June | 7 November | 10 November | 188 |
| 1980 | 8 May | 11 October | 20 October | 165 |
| 1981 | 5 May | 14 October | 14 October | 162 |
| 1982 | 8 May | 25 October | 26 November | 202 |
| 1983 | 22 April | 21 October | 21 October | 182 |
| 1984 | 8 May | 5 November | 5 November | 182 |
| 1985 | 28 April | 1 November | 3 November | 189 |
| 1986 | 22 April | 10 September | 13 September | 144 |
| Average | 1 May | | 4 November | 187 |

5 Effects of Elevation

During 1986 the average difference in daily maximum air temperature between Stirling (Parkhead) and Ochil Hills (Carim) was 3.7°C which is equivalent to a lapse-rate of 12.5°C/1000m. The average difference in minimum temperature was 1.5°C, or a lapse-rate of 5.1°C/1000m. The difference in mean temperature of 2.6°C represents a lapse-rate of

8.8°C/1000m which is considerably higher than the 6.5°C/1000m in general use as an elevation correction in the preparation of maps of sea-level air temperature. Weather patterns during each month tended to mask the usual seasonal variation in lapse-rate, which usually reach their steepest in spring and early summer and shallowest in autumn and winter. However, lapse-rates in mean air temperature were slightly higher in March, April and May, and lower between September and January. During September, nocturnal temperature inversion was relatively frequent and the mean difference in minimum temperature between Stirling and Ochil Hills stations was only 0.1°C.

The difference in annual precipitation between the two stations was 714.2mm, giving a gradient of 2.40mm/m for 1986.

## 6 Weather Watchers

The Weather Watchers Network operates from its base in south-west Scotland. The mainstay of its operations are the reports which it provides to the AA for broadcasting, and the information which is sent to Tourist Information Centres in south-west Scotland. The Climatic Hazards Unit here at Stirling University hosted a weekend seminar on weather observing and broadcasting on September 20-21 1986 which was organised by the Weather Watchers Network. The Unit may also be hosting the Network's Annual General Meeting on April 25th 1987. Anybody interested in learning more about the network, particularly those willing to be telephoned for the occasional quick report (eg. 'is it raining?', 'how much snow have you had?' . . .), should contact Roland Chaplain at Weather Watchers, Hilbre Cottage, Laurieston, Kirks, DG7 2PW.

## 7 Rainfall Trend

A detailed examination of trends in annual and seasonal rainfall in the Stirling area is in progress and has been reported in Rowling (3 above). However, it is worthwhile noting that the upward trend in annual rainfall reported in Bulletin No. 5 (1983) has continued. Figure *5* indicates very clearly that since 1972 there has been an average rate of increase of 22mm/year. Most of this has been due to a marked increase in *autumnal* rainfall, totals for spring and summer showing little discernible change.

## 8 Weather Station Exposure Project

Response to a call for participants in this project was very good. Site data for more than 40 stations were available for the first calibration. Agreement between estimated exposure, on a 1 to 9 scale, and exposure derived using inclination of horizon at the eight principal compass points, was very good. This objective method of site assessment will provide a basis for correction for local bias in observations due to shelter, and for assessment of the suitability of proposed sites for new weather stations.

The project has been supported by a grant from the Royal Meteorological Society. It is intended that final results will be published in *Weather.*

## 9 Forth Estuary Mud Temperatures

Temperatures in the upper, near-surface, layers of estuarine muddy sediments are most closely related to atmospheric conditions, whereas at depths greater than 0.25m water temperature at high tide would appear to be the dominant control. A long series of temperatures at depth 0.05m in the mudflats of the middle Forth Estuary has been generated using a statistical relationship established between observed mud and air temperatures for 1981 when recording equipment was in operation on Skinflats. Daily air temperatures (maximum and minimum) for Stirling (Parkhead), approximately 12km north-west of Skinflats, were used to predict daily mean mud temperature at 0.05m for the period 1975 to 1986. Monthly means were generated from these data (Figure 6) which have been related to ecological population data.

The highest mean temperatures are reached in July and the lowest in December or January. Where summer temperatures approach 20°C considerable drying out and polygonal cracking of the mud surface occurs at low water (eg 1976). Winter freezing of the mud surface to a depth of 5cm is relatively rare but persisted for several days during January 1982.

## 10 Stream Temperatures

Stream temperature data from Howietoun Fish Hatchery collected during 1985 (Harrison 1986) and air temperature data for Stirling (Parkhead) have provided a basis for statistical estimation of stream temperatures over the period 1983 to 1986. These are currently being compared with fish productivity data for this period in order to assess the measure of control exerted by stream temperature fluctuation.

HARRISON, S. J. 1986 Stream temperatures at Howietoun Fish Farm *Forth Naturalist and Historian* 9, 25-37.

| | Mean Maximum °C | Difference from Average | Highest Maximum | Lowest Maximum | Mean Minimum °C | Difference from Average | Highest Minimum | Lowest Minimum | Mean °C | Number of days <0°C | Mean Soil Temp. °C (0.3m at 09) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 5·0 | −0·8 | 9·6 | 1·6 | (−1·1) | −1·1 | 3·5 | (−8.0) | 2·0 | (18) | 1·4 |
| February | 2·6 | −3·5 | 5·0 | − 0.5 | − 2·5 | −2·9 | 1·4 | −7·4 | 0·1 | 23 | 1.0 |
| March | 8·3 | −0·3 | 11·7 | 1·7 | 0·8 | −0·8 | 6.8 | −9·2 | 4·6 | 7 | 3·4 |
| April | 8·9 | −2·6 | 12·9 | 3·4 | 1·0 | −2·0 | 5·6 | −3·2 | 5·0 | 11 | 5·7 |
| May | 13·6 | −1·3 | 18·8 | 9·9 | 6·1 | +0·6 | 10·6 | 3·0 | 9·9 | 0 | 10·5 |
| June | 17·7 | +0·3 | 26·0 | 13·3 | 8·3 | +0·1 | 13·5 | 2·6 | 12·9 | 0 | 14·6 |
| July | 18·2 | −1·5 | 23·2 | 14·0 | 10·6 | −0·2 | 15·4 | 5·3 | 14·4 | 0 | 16·4 |
| August | 16·8 | −2·3 | 20·0 | 13·7 | ( 8·1) | −1·9 | 11·5 | 1·8 | 12·4 | 0 | 14·7 |
| September | 15·5 | −0·4 | 20·8 | 10·6 | 4·8 | − 3·4 | 13·4 | −3·2 | 10·1 | 6 | 12·2 |
| October | 12·9 | +0·2 | 16·6 | 6·3 | 5·2 | −0·3 | 11·3 | 0·7 | 9·0 | 0 | 10·1 |
| November | 10·0 | +1·2 | 13·5 | 4·4 | 2·4 | −0·1 | 7·7 | −5·9 | 6·2 | 5 | 6·4 |
| December | 7·0 | +0·1 | 13·5 | 2·3 | 0·8 | −0·5 | 6·0 | −3·0 | 3·9 | 15 | 4·1 |
| YEAR | 11·4 | −0·9 | 26·0 | − 0·5 | 3·7 | −1·1 | 15·4 | −9·2 | 7·6 | 85 | 8·4 |

Table 1 Monthly Temperatures (Stirling, Parkhead) 1986

| | Mean Maximum °C | Difference from Average | Highest Maximum | Lowest Maximum | Mean Minimum °C | Difference from Average | Highest Minimum | Lowest Minimum | Mean °C | Difference Parkhead − Carim °C | No. days < 0°C |
|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 1·9 | −0·7 | 7·2 | − 1·3 | − 2·0 | −0·7 | 4·2 | − 6·6 | − 0·0 | 2·0 | 24 |
| February | −2·0 | −4·0 | 0·0 | − 4·3 | −5·7 | −3·8 | −1·2 | −11·0 | − 3·9 | 4·0 | 28 |
| March | 4·0 | −1·0 | 8·0 | − 3·1 | −0·8 | −1·0 | 4·7 | −10·0 | 1·6 | 3·0 | 18 |
| April | 5·4 | −2·8 | 9·7 | 0·4 | −1.3 | −2·3 | 2·1 | − 5·2 | 2·1 | 2·9 | 23 |
| May | 10·0 | −1·3 | 15·1 | 6·0 | 4·0 | −0·2 | 7·5 | 1·9 | 7·0 | 2·9 | 0 |
| June | 14·8 | +1·0 | 23·2 | 9·9 | 6·6 | −0·6 | 12·2 | 0·0 | 10·7 | 2·2 | 0 |
| July | (14·7) | −1·7 | (20.3) | 10.1 | ( 8.4) | −0·9 | 12.5 | 4.9 | ( 11.5) | 2·9 | 0 |
| August | 13·1 | −2·6 | 16·6 | 9·9 | 6·1 | −2·7 | 10·0 | 1·8 | 9·6 | 2·8 | 0 |
| September | 11·7 | −0·6 | 15·0 | 9·6 | 4·7 | −2·3 | 11·3 | − 2·3 | 8·2 | 1·9 | 4 |
| October | 8·8 | −0·2 | 13·0 | 2·1 | 4·8 | +0·2 | 9.7 | − 0·2 | 6·8 | 2·2 | 2 |
| November | 6·4 | +0·4 | 10·5 | − 0·2 | 1·6 | −0·2 | 7·3 | − 5·8 | 4·0 | 2·2 | 7 |
| December | ( 3.8) | 0 | (11.1) | 0.3 | ( 0·2) | +0·2 | 5·8 | − 2·7 | ( 2·0) | 1·9 | 15 |
| YEAR | 7.7 | −1·1 | 23·2 | − 4.3 | 2.2 | −1.2 | 12.5 | −11·0 | 5·0 | 2·6 | 121 |

Table 2 Monthly Temperatures (Ochil Hills: Carim) 1986

| | Total Precipitation mm | Percentage of Average | Percentage of Average Accumulated | Greatest fall in 24 hours | | Number of Days | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Amount (mm) | Date | Precipitation Recorded | 0·2mm or more | 1·0mm or more | 5·0mm or more |
| January | 109·8 | 107·2 | 107·2 | 20·8 | 9th | 23 | 23 | 18 | 8 |
| February | 13·2 | 24·8 | 79·0 | 7·2 | 5th | 15 | 14 | 2 | 1 |
| March | 83·9 | 105·9 | 88·1 | 10·0 | 22nd | 26 | 24 | 19 | 8 |
| April | 60·9 | 159·0 | 98·0 | 14·4 | 15th | 16 | 16 | 7 | 5 |
| May | 145·2 | 225·5 | 122·3 | 16·5 | 17th | 26 | 24 | 23 | 12 |
| June | 49·2 | 92·5 | 118·3 | 17·4 | 17th | 9 | 9 | 6 | 3 |
| July | 41·0 | 73·1 | 112·6 | 15·4 | 28th | 13 | 13 | 10 | 2 |
| August | 58·4 | 91·7 | 110·0 | 10·6 | 15th | 13 | 13 | 10 | 5 |
| September | 29·9 | 29·9 | 96·9 | 19·3 | 2nd | 9 | 9 | 7 | 1 |
| October | 104·0 | 114·5 | 99·1 | 22·8 | 29th | 23 | 21 | 16 | 7 |
| November | 161·0 | 142·5 | 105·2 | 29·4 | 24th | 28 | 27 | 19 | 10 |
| December | 181·9 | 178·3 | 113·3 | 29·8 | 4th | 27 | 26 | 25 | 14 |
| Year | 1038·4 | 113·3 | – | 29·8 | 4th/12th | 228 | 219 | 162 | 76 |

Table 3. Monthly Precipitation (Stirling: Parkhead) 1986

| | Total Precipitation mm | Percentage of Average | Percentage of Accumulated Average | Maximum Temperature °C | Minimum Temperature °C | Soil Temperature (0.3m at 0900)°C | Total Precipitation mm | Maximum Temperature °C | Minimum Temperature °C | Total Precipitation mm |
|---|---|---|---|---|---|---|---|---|---|---|
| January | (200.0) | 133.9 | 133.9 | 5.8 | 0.0 | 2.7 | 102.4 | 2.6 | −1.3 | 149.4 |
| February | ( 47.1) | 70.2 | 114.1 | 6.1 | 0.4 | 2.5 | 53.3 | 2.0 | −1.9 | 67.1 |
| March | 179.5 | 118.6 | 116.0 | 8.6 | 1.6 | 4.3 | 79.2 | 5.0 | 0.2 | 151.4 |
| April | ( 82.6) | 144.9 | 119.8 | 11.5 | 3.0 | 7.5 | 38.3 | 8.2 | 1.0 | 57.0 |
| May | (266.2) | 215.5 | 141.4 | 14.9 | 5.5 | 11.4 | 64.4 | 11.3 | 4.2 | 123.5 |
| June | 62.4 | 84.1 | 134.6 | 17.4 | 8.2 | 14.6 | 53.2 | 13.8 | 7.2 | 74.2 |
| July | 69.0 | 97.3 | 130.8 | 19.7 | 10.8 | 16.6 | 56.1 | 16.4 | 9.3 | 70.9 |
| August | ( 80.9) | 73.2 | 122.8 | 19.1 | 10.0 | 16.2 | 63.7 | 15.7 | 8.8 | 110.5 |
| September | 52.0 | 29.5 | 106.0 | 15.9 | 8.2 | 13.5 | 100.1 | 12.3 | 7.0 | 176.5 |
| October | (217.6) | 124.8 | 108.9 | 12.7 | 5.5 | 10.1 | 90.8 | 9.0 | 4.6 | 174.3 |
| November | (227.0) | 150.7 | 113.7 | 8.8 | 2.5 | 6.1 | 113.0 | 6.0 | 1.8 | 150.6 |
| December | (268.3) | 140.3 | 117.1 | 6.9 | 1.3 | 3.8 | 102.0 | 3.8 | 0.0 | 191.3 |
| YEAR | 1752.6 | 117.1 | | 12.3 | 4.8 | 9.1 | 916.4 | 8.8 | 3.4 | 1496.7 |
| | Table 4 Monthly Precipitation Ochil Hills (Carim) 1986 | | | Table 5 Climatological Averages for Stirling (Parkhead) 1971-86 | | | | Table 6 Climatological Averages for Ochil Hills (Carim) 1981-1986 | | |

Tables 4, 5 and 6 Rainfall and temperatures, 1986

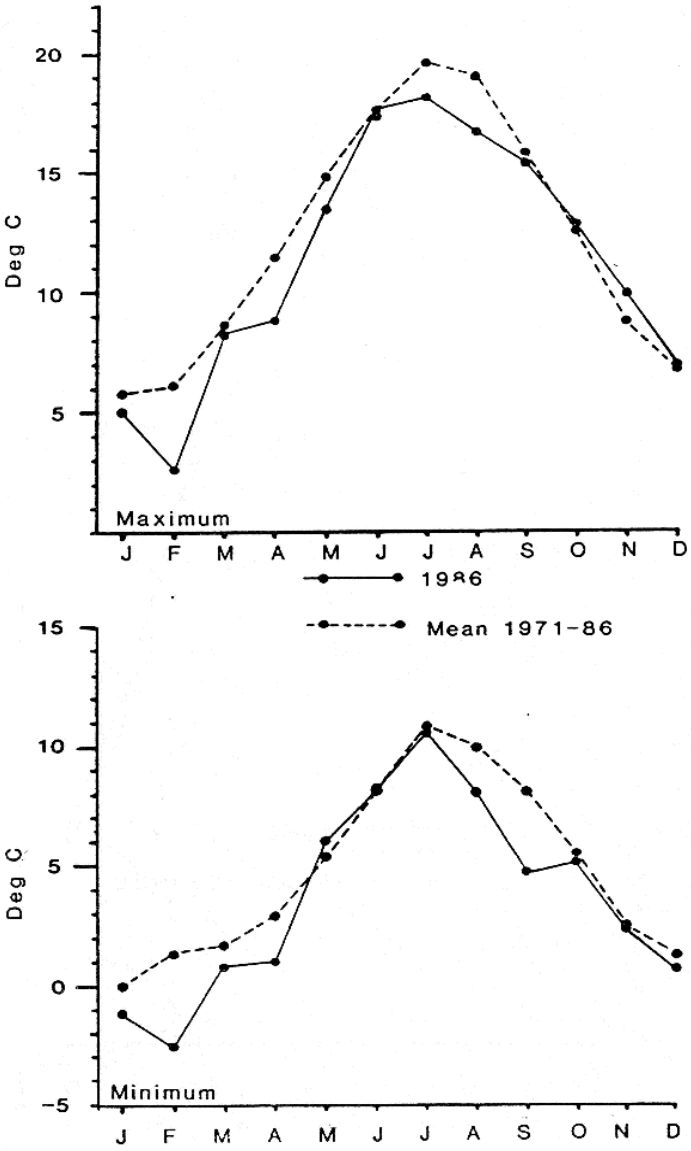
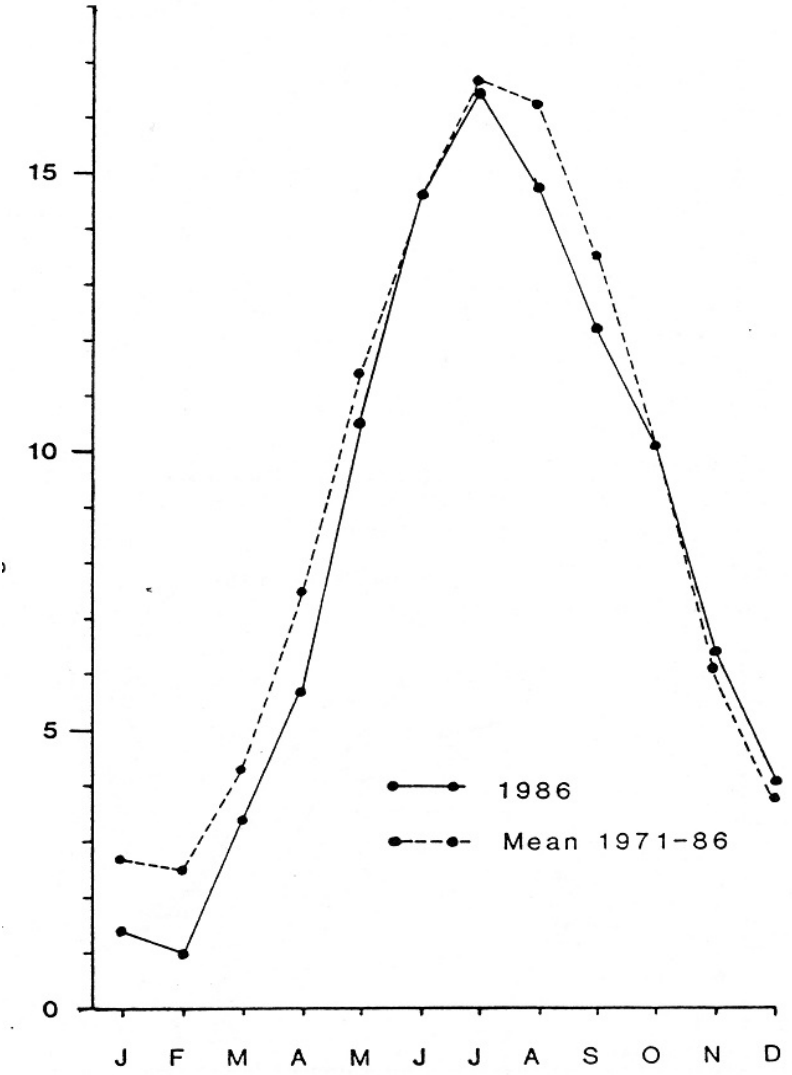



Figure 1 Air temperature at Stirling (Parkhead) 1986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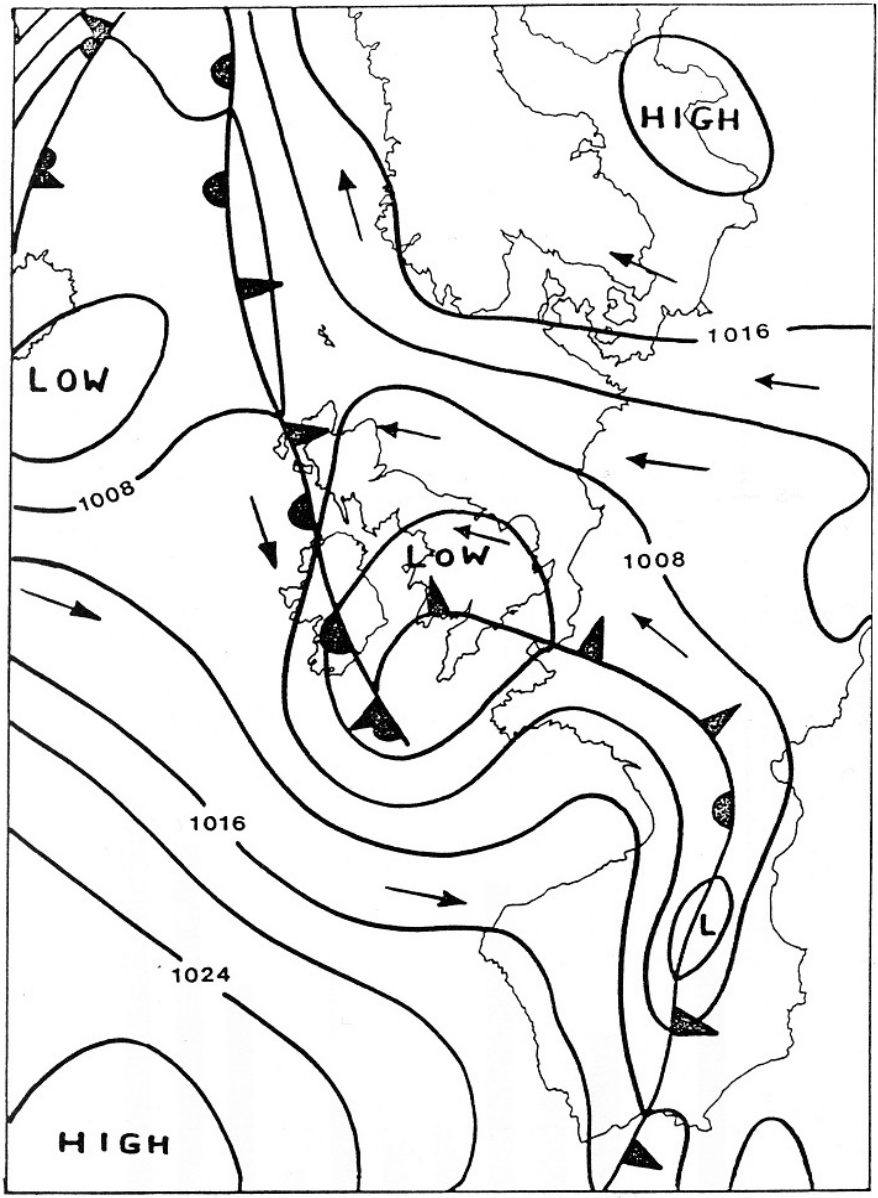
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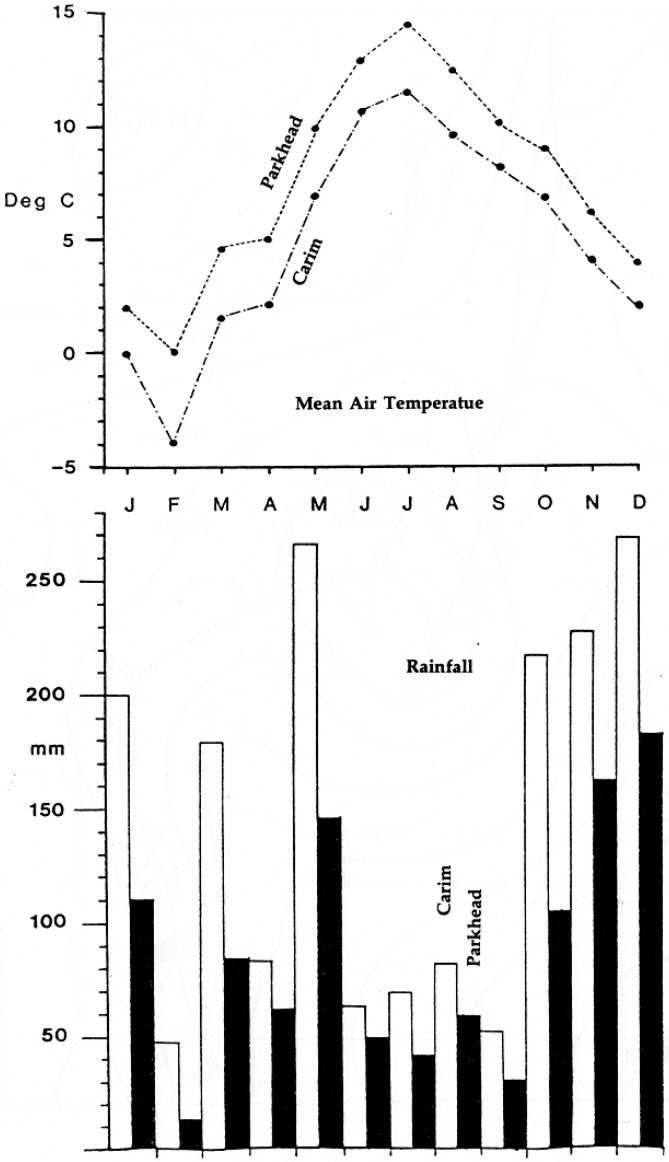
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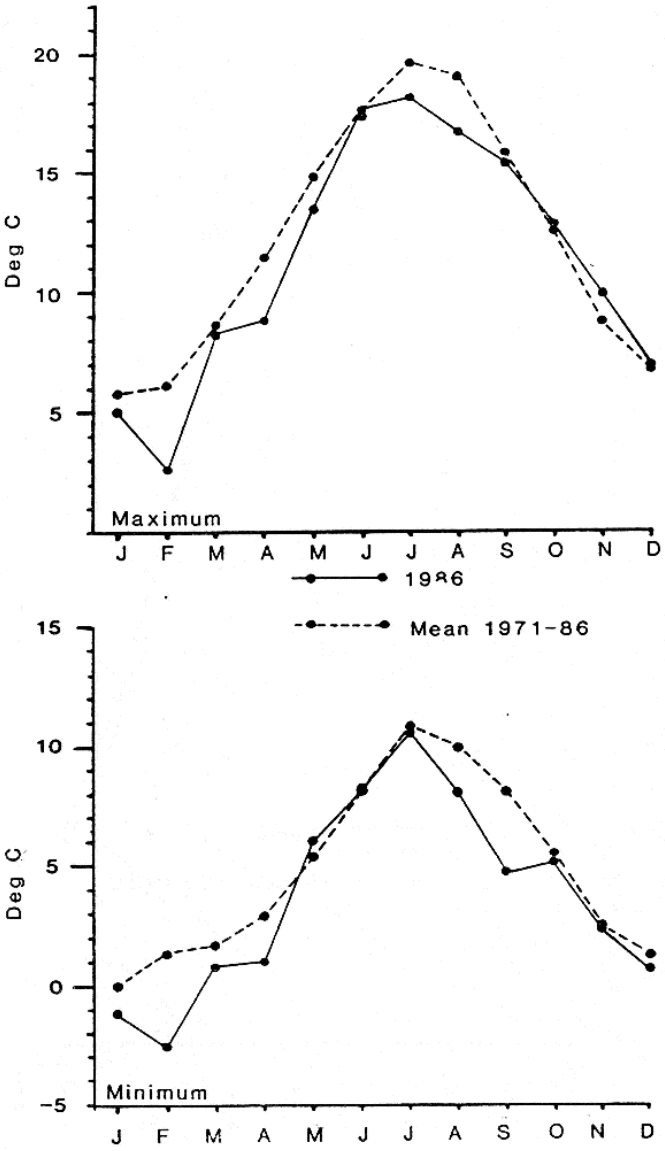
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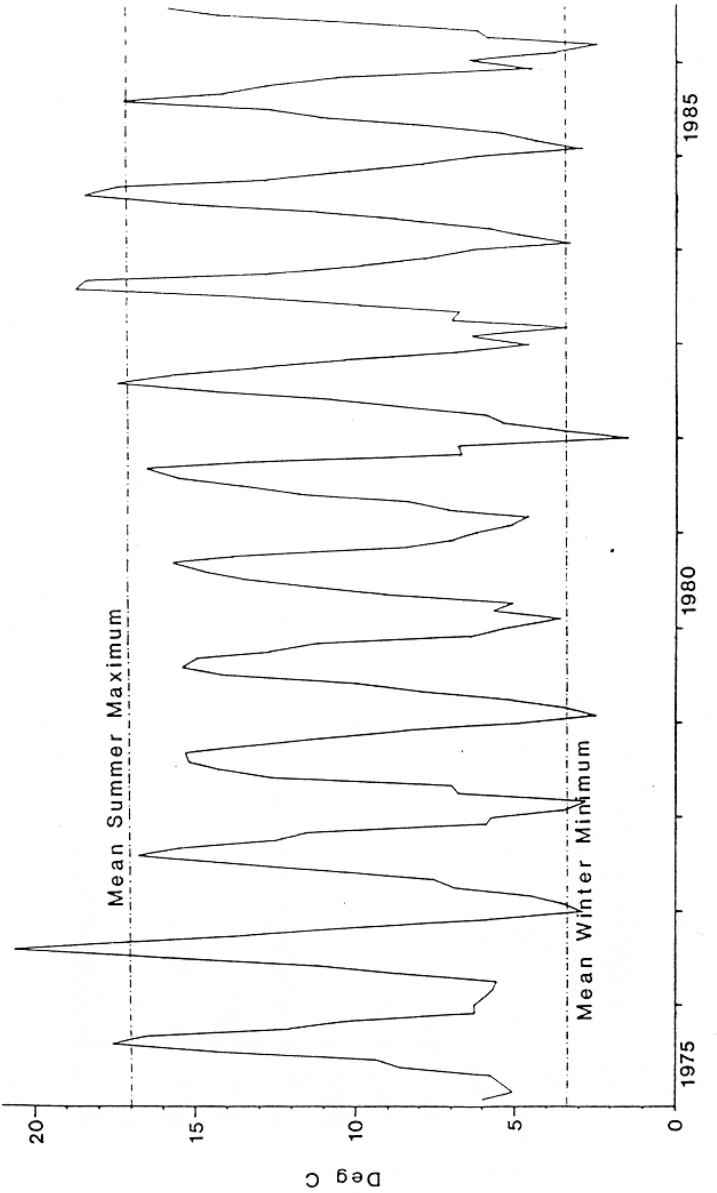
Deg C
20
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1975
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1985
Mean Summer Maximum
Mean Winter Minimum

# ANNUAL **CLIMATOLOGICAL BULLETIN NO. 9, 1987**

S. J. Harrison University of Stirling

## THE WEATHER OF 1987

Temperature *and rainfall values referred to in the following relate to Stirling (Parkhead) unless otherwise stated.*

Scotland was certainly the place to be during 1987. England and Wales had snowstorms in January, severe floods, and the destructive October storm. 1987 in Scotland was a comparatively unexceptional year after the brief period of severe snowfall in January. After a generally cool and wet spring, and a traditionally damp summer, autumn was mild and lasted well into November. The frost-free season, between the last air-frost of spring (12th April) and the first of autumn (23rd October) was exceptionally long.

January. Very cold and heavy snow.

A complex depression and associated fronts brought rain in a cold south-easterly wind on the 1st, the wettest day of the month. High pressure developed to the west of the British Isles after the 2nd resulting in a spell of cold dry weather. Temperatures increased overnight between the 3rd and 4th as fronts moved south-eastwards across Scotland but the temperature began to fall again in a strong showery north-westerly wind on the 5th. High pressure dominated the weather until the 8th bringing very low night temperatures. As pressure began to increase to the north and north-east of Scotland a fresh to strong easterly airstream brought fine drifting snow from the 10th. The snowfall increased in severity over the next four days bringing general paralysis to road and rail. By the 14th the snow was 30 cms deep on low ground drifting to a metre or more. On the 16th a warm front began to make very slow eastwards progress across Britain bringing a slow thaw. However it was not until the 20th that the thaw reached south-east England by which time conditions had become exceptionally severe. An anticyclone dominated the weather from the 21st until the end of the month. Frosts were frequent and visibility generally poor with fog patches. The deeper snowdrifts, by now very dirty, were still in evidence at the end of the month.

February. Mild and wet, becoming colder

As high pressure retreated slowly eastwards into Europe, night frosts

gave way to mild wet weather as fronts approached from the west. Rain falling on cold road surfaces on the 2nd and 3rd resulted in black ice. As a ridge began to extend eastwards across Britain after the 3rd Scotland was brought into an unsettled but mild westerly airstream. From the 8th a complex area of low pressure and associated frontal troughs drifted eastwards and filled bringing at first some rather dull and wet weather with snow on higher ground, but clearer conditions after the llth. The 9th was exceptionally wet (20.1mm). High pressure dominated the weather until the 24th when vigorous Atlantic cyclonic systems moved in from the west again. The llth to 18th were bright and sunny with moderate night frosts (-5.2°C on 15th). A weak frontal trough moved slowly south-eastwards across Scotland late on the 18th bringing cloud and an overnight fall of light snow. The weather remained cloudy and as a cold front crossed from the north-east further light rain fell on the 22nd. After the 24th, as pressure fell, the weather was more unsettled but temperatures rose quickly in a mild south-westerly airstream on the 28th (maximum 13.8°C) which was the warmest February day in England since 1961, exceeding 16°C in southern counties.

March. Cold and wet.

A shallow depression with active frontal systems moved to the west of Scotland on the 1st bringing heavy and continuous rain (17.3mm) and strong winds. As pressure increased from the south-west on the 2nd the temperature fell in a cold north-westerly wind. As high pressure drifted slowly eastwards frontal systems brought rain from the west which turned to snow in the late evening of the 3rd (5cms in Stirling). With high pressure established over Scandinavia complex frontal systems became almost stationary over the British Isles from the 5th bringing heavy and continuous rain which began to turn to snow. On the 7th sleet and snow fell in a bitterly cold south-easterly wind, daytime temperatures rising to only 2.9°C. On the 8th a ridge of high pressure extended across Britain from the east which gradually cleared the skies and brought some glimpses of the sun by the 10th. Under clear night skies there were moderate night frosts on the llth and 12th but daytime temperatures were much improved. Frontal systems crossing south-eastwards on the 13th heralded more unsettled weather which dominated the remainder of the month. As pressure increased to the west of Scotland on the 17th the winds went round to a more northerly quarter and sleet and snow affected parts of the British Isles over the next few days. The high gave way to complex frontal troughs on the 21st with wet but milder weather. A vigorous depression approached from the south-west on the 26th and deepened very quickly as it crossed the British Isles, pressure falling to 956mb in Stirling. Heavy rain (25.9mm) fell in gale force winds on the 26th and 27th which resulted in storm damage and some deaths over Britain. In the wake of the storm winds were generally fresh north-westerly. Frontal troughs brought further rain after the 29th.

April. Mild and wet, becoming drier.

As an area of low pressure drifted southwards and deepened the weather remained dull with light rain in a freshening easterly wind until the 5th. The low filled as it drifted northwards but rain continued to fall from a northwards moving front. As pressure increased to the south-west, the British Isles were brought into an unsettled period dominated by Atlantic weather systems. Heavy rain on the 10th (23.0mm) fell as snow on higher ground. The weather became more settled as a ridge of high pressure extended north-eastwards across Scotland on the llth and 12th but rain returned late on the 12th. High pressure returned on the 14th to dominate the weather for the next four days. A fresh westerly wind decreased slowly and the 17th was calm and sunny (15.6°C). Early morning fog on the 18th cleared slowly in a freshening south-easterly breeze as pressure began to fall from the west. Rain fell on the 18th and 19th. An anticyclone over continental Europe controlled the weather until the 28th bringing early mists clearing to hot sunny days. The temperature reached 22.2°C on the 28th. A cold front moving south-eastwards on the 30th brought rain in the late evening.

May. Cool but dry.

While pressure was high to the west of the British Isles winds were cold clear north-westerly for the first four days. As the anticyclone moved eastwards wind speeds increased and daytime temperatures improved. The 7th was a sunny and warm day (17.8°C). Pressure again began to increase to the west and by the 9th cold north-westerly winds had returned. Shallow depressions and associated fronts brought occasional rain between the 10th and 15th. Winds gradually veered northerly and the weather remained dull until the 19th when skies cleared behind a southwards moving weak front. The 20th was warmer than previous days (19.0°C) but felt cold in the fresh northerly breeze. As the anticyclone moved towards Iceland after the 21st the winds veered north-easterly and the next six days were grey and cold. A vigorous depression and associated fronts which moved in from the west on the 29th returned winds to a warmer quarter but brought continuous heavy rain (11.5mm on the 29th) followed by showers.

June. Cool, cloudy and wet.

A series of Atlantic lows and fronts brought unsettled weather for the first seven days. A vigorous depression moved across Scotland on the 5th and 6th depositing 38.6mm of rain during less than 48 hours, with occasional claps of thunder. A cool and moderately dry north-westerly airstream developed in its wake but unsettled weather returned on the 10th as a shallow low persisted over the British Isles and the North Sea until the 15th. Heavy showers occurred during this period some of which fell as hail.

While pressures remained low over Scandinavia visibility was excellent in the cool polar air and the days 16th to 19th were sunny. As a warm front approached from the south-west on the 21st visibility deteriorated and rain began to fall in the late evening. The 22nd and 23rd were dull wet days with continuous light rain as a shallow low formed to the north-west of Scotland. The weather remained unsettled for the rest of the month but, apart from rain on the 27th, was generally dry with occasionally long sunny periods. A warm front which brought rain late on the 27th also imported warm tropical air and the last three days of the month were very mild.

July. Warm with unsettled periods.

As pressure increased from the south, the weather was generally settled for the first nine days although light showers fell on the 1st and 3rd. Daytime temperatures reached 24.5°C on the 5th and 6th. As high pressure retreated south on the 8th a cool northerly breeze lowered temperatures and by the 9th fronts were approaching from the west bringing overnight rain. The weather in England remained settled for a few more days but as a broad low drifted slowly south-eastwards from Iceland generally unsettled weather affected most of Britain after the 14th, which was the wettest day of the month (9.4mm). The low persisted until the 20th when it moved to the Low Countries and filled. As a ridge of high pressure lay over Scotland the 21st to 25th were again sunny and warm. As high pressure drifted south-westwards after the 26th more changeable weather returned for the remainder of the month.

August. Cloudy cool and wet.

With high pressure over the Atlantic and low pressure over Scandinavia Scotland experienced a cool northerly airstream during the first six days. Night-time temperatures fell below the seasonal average (3.5°C on the 5th). Weak fronts brought thundery showers to southern England and a waterspout was observed off the Isle of Wight on the 6th. The Scandinavian low began to drift westwards and fill on the 6th bringing light overnight rain after which the weather became warm and sunny until the 10th. Atlantic lows brought rain after the llth, which was heavy at times. 30.0mm was recorded on the 15th. Southern England became very warm with heavy thundery rain and floods on the 22nd and 23rd (82.7mm in Birmingham). Temperatures reached only 21.0°C at Stirling University although 23.9°C was recorded in Bridge of Allan. High pressure extended briefly across Scotland on the 24th which was sunny and warm. Although high pressure affected much of the British Isles the weather remained unsettled for the rest of the month with occasional rain and sunny periods. A vigorous depression to the north of Scotland brought a further 17.4mm of rain to Stirling late on 31st. September. Unsettled at first becoming dry.

A ridge of high pressure extended northwards across Britain bringing a warm and dry first three days. Eastwards moving depressions to the north of Scotland and their associated fronts dominated the weather until the 14th when pressure began to increase from the south-east. A vigorous and deepening depression brought stormy conditions with sleet and hail between the 10th and 12th. While pressure remained high the days 15th to 17th were relatively dry but as the anticyclone retreated eastwards unsettled weather with some sunny periods returned until the 24th. An anticyclone to the west moved slowly eastwards across Britain to bring a period of fine autumnal weather between the 24th and 29th. However, night-time air temperatrues fell sharply, almost reaching freezing point (0.3°C on 27th).

October. Cool and wet.

A ridge of high pressure extending eastwards from the Baltic kept Scotland in a run of dry easterly winds associated with generally poor visibility for the first three days. Fronts moved south-eastwards across Scotland on the 5th and 6th bringing rain (15.9mm). A deepening depression crossed northern Scotland on the 7th and 8th bringing heavy rain (17.2mm) and strong winds. With complex areas of low pressure dominating the weather map conditions in Scotland remained generally changeable until the 21st. The most noteworthy events during this period were the vigorous depressions which affected England and Wales between the 15th and 17th. A rapidly deepening depression approached Britain from the south-west on October 15th which crossed the English Midlands in the early hours of the 16th. Winds gusting to hurricane force caused considerable damage (See Notes 2). Another depression following in its wake brought rain which was heaviest in Wales where there was severe flooding. Further heavy rain and floods in England and Wales on the 21st were followed by somewhat more settled weather under the influence of high pressure. The first autumnal night frosts occurred under clear night skies (-3.4°C on 23rd) although these were restricted to lower ground. A slow moving frontal system lay over Scotland on the 25th, 26th and 27th bringing heavy rain. Night frosts returned on the 29th as skies cleared again.

November. Mostly dull; unsettled mid-month.

High pressure dominated the weather in Scotland for the first seven days. Although mild, the weather was dull with poor visibility. After the 8th high pressure drifted eastwards to be replaced by depressions and associated fronts which brought changeable but generally wet weather until the 19th. As a deep depression crossed northern Scotland on the llth and 12th winds became strong with driving rain (48 hour total 18.9mm). Pressure increased to the west of the British Isles from the 21st bringing in

cold northerly air. Air temperatures fell over the next seven days reaching a maximum of only 0.2°C and a minimum of -4.5°C on the 26th. As a ridge extended northwards across Britain the weather became cold and grey with mist and fog on the 27th and 28th. A weak front brought a brief period of rain on the 29th but improved visibility. The weather was bright and sunny on the 30th with high pressure centred over Scotland.

December. Dry and cold at first, becoming wet and very mild.

High pressure dominated the weather map for the first two weeks. After a relatively clear day on the 1st, a cloudy easterly airstream kept the weather cold and dull until the 6th when a cold front advanced southwards across Scotland importing colder clearer air. Temperatures remained very low until the 14th with night frosts. Light rain fell as a weak frontal system moved in from the east during the afternoon of the llth, which ameliorated overnight temperatures a little. However, on the 13th daytime temperatures rose to only -0.7°C after an early morning minimum of —6.5°C. High pressure retreated quickly eastwards on the 15th and by the early hours of the 16th the temperature had risen several degrees. Frontal systems and a fresh south-westerly airstream ensured that the weather remained wet and unseasonally mild for most of the remainder of the month. As pressure rose briefly on the 22nd the weather became calmer and colder but rain returned on the 23rd as high pressure drifted eastwards. After a Christmas Day which was pleasantly mild and sunny, rain fell on every remaining day of the month. The rain was at times very heavy and associated with fresh to strong winds from a southerly quarter. 18.3mm fell on the 27th, the month's wettest day and by the 28th there was moderate local flooding. 1987 bowed out with a wild and wet Hogmanay.

## DATA SOURCES

Stirling (Parkhead) Grid Reference: NS 815 969
Height above sea-level: 35 metres Established: 1970
Aspect: South-east Shelter Index: 33.2 (Slightly sheltered)
Location: University gardens at the north-east corner of the campus.

Monthly returns of daily (0900 to 0900 GMT) observations are submitted to the Meteorological Office and the Climatological Observers Link. Data are published occasionally in the Journal of Meteorology. Missing temperature data are estimated using observations from Westerlea Drive Bridge of Allan (S. J. Harrison). During 1987 a ground-level raingauge and 2m run-of-wind anemometer were installed. These are read on Mondays.

Ochil Hills (Carim) Grid Reference: NN 864 049
Height above sea-level: 332 metres Established: 1980
Aspect: North-west Shelter Index: 16.6 (Exposed)
Location: The upper catchment of the Burn of Ogilvie near to the ruined Carim Lodge. Surrounded by open moorland.

Autographic recording station serviced on Mondays. Due to a variety of circumstances data were lost for several days during 1987. The autographic raingauge was unreliable for most of the year and is to be replaced. The Autographic Weather Station was out of action for all of 1987 due to the failure of the storage unit and the delay in obtaining a replacement. As in 1986, the ground-level raingauge occasionally collected less than the standard gauge. This is currently under investigation.

CLIMATOLOGICAL AVERAGES

Climatological averages are usually calculated for periods of 30 years (temperature) or 35 years (rainfall). This is because in Britain there is an inbuilt year to year variation in all the parameters used to define climate. Averages based on a smaller number of years may be unduly biased by one extreme value. As there are only 17 years of records for Stirling (Parkhead) and 7 for Ochil Hills (Carim) the averages published in Tables 5 and 6 should be used with caution.

INDEX TO FOLLOWING TABLES:



NOTES

1 The January snowstorms Figure 4

During the first ten days of January pressure had been increasing to the north-east of the British Isles while pressure remained low over southern Europe. This generated an easterly airstream by the 10th which imported cold air from eastern Europe. In Scotland heavy snow fell every day between the 10th and 14th accumulating to 30 cms or more on low ground and considerably more on the hills. Fresh snow drifted in the fresh east to north-easterly wind making it difficult, and at times impossible, to keep roads open and maintain rail services. Third-rail electric services in south-east England were badly affected which eventually saw snow-moving

equipment being sent south from Inverness. Very low temperatures accompanied the snow, daytime temperatures on the llth and 12th rising to only -2.8°C and -3.2°C respectively. The North Sea, at a temperature of 7° C, protected Britain from the very low temperatures ( —20°C or less) being experienced in north-west Europe. Temperatures were not as low as those experienced in January 1982 and the snow accumulation was less than in January 1984 but, taken together, the conditions were reminiscent of February 1947. As warm air edged very slowly eastwards Britain was divided into a mild north and a cold south. On the 19th the maximum temperature in north-west Scotland was 8°C but only -3°C in the Channel Islands.

## 2 The October 'Hurricane' Figure 5

A vigorous depression developed in Biscay early on the 15th and began to move very quickly north-eastwards towards the British Isles after 18.00 GMT. Depressions which approach from the south-west are well fuelled with tropical air and have a tendency to deepen. This one deepened quickly, its centre pressure falling from 970mb at 12.00 to 958mb at midnight, when its centre lay over Cornwall. By 06.00 on the 16th it lay over North Yorkshire (Figure 5A) then it travelled northwards along the North Sea coast to a position north of Shetland by 18.00. The winds were strongest on the south-eastern side of the depression and during the early hours of the 16th much of southern England and northern France experienced mean wind speeds of storm force, which had abated by 09.00. Gusts exceeded 'hurricane' force (64 knots) in many places (Figure 5B) causing considerable structural damage to property, an almost total paralysis of communications and widespread electrical power failure as overhead lines were brought down. The damage was estimated at many millions of pounds. To those of us in Scotland the picture was reminiscent of the great 'Glasgow Gale' of 1968 which flattened large areas of Hermitage Woods behind the University.

At the time, much was made of the apparent failure of the Met Office to provide adequate warnings. In their defence it must be said that such depressions are notoriously fickle in their behaviour and are therefore more difficult to forecast accurately. Warnings were issued as the storm was almost on the doorstep. One may well ask what could have been done had warnings been given. True, emergency services could have been placed in a state of greater readiness but the general level of damage could not have been prevented. When such events occur it is clear that there is a desire to lay blame at somebody's door. Much of the material used by James Wilkinson on the BBC TV national news was provided by Dr Harrison of the University's Climatic Hazards Unit. Use of the term 'hurricane' by the media was a little misleading as such storms have a totally different structure to the intense mid-latitude depression which brought the strong winds on this occasion. Also, only *gust* speeds exceeded hurricane force, mean wind

speeds being slightly less but of storm force.

Footnote: The Royal Meteorological Society intends to devote one of the 1988 issues of Weather to the October storm.

3 The Summer of 1987

It was remarkable how frequently the news media south of the border referred to the summer of 1987 as being particularly poor. This statement was certainly true if you lived in East Anglia or the South-East, which had as much as three times their normal rainfall. However, the summer up here in Scotland wasn't all that bad. Indeed, if you spent your holiday on the west coast or in the Hebrides you probably had pleasantly sunny weather.

Over the years many indices of summer quality have been used, some based on simple averages (temperature, rainfall, sunshine etc.) others on more detailed statistical analyses. An index has been developed for Central Scotland based on temperature and rainfall. Use is made of numbers of days of particular weather character rather than monthly averages or totals. The index is derived from the number of days when the maximum air temperature is greater than or equal to 20°C (Warm Day), and when rainfall is 0.2mm or greater (Rain Day). Numbers of days have been determined for each of the months June, July and August for each year since 1971. Summer totals have been derived from these values and the standard deviations and means calculated for warm days (CTWD.XWD) and rain days (drd.XRo). The index for each individual year is then determined by:

$$\text{Index} = \frac{\text{No. Warm Days - XWD}}{\sigma WD} \_ \frac{\text{No. Rain Days - XRD}}{\sigma RD}$$

Negative index values indicate a generally poor summer, positive a good summer. The warm dry summers of 1983 and 1984 have index values of 2.78 and 2.80 respectively while the wet summer of 1985 scores -3.91. In comparison, the summer of 1987 scored 0.25 which places it on or about the average.

4 Weather Sensitivity and Services in Scotland - Climatic Hazards Unit

Weather and climate have always been important to Scotland. In the past, extreme atmospheric conditions have led to notable disasters such as the collapse of the Tay Bridge in 1879 and the Glasgow Storm of 1968 which killed nine people and badly damaged some 70,000 local authority houses. In the summer of 1985, much of Scotland had more than double the normal amount of rainfall with a direct loss in agricultural production estimated to be between £150 and £200 million. Today, there are few aspects of Scottish life that are not affected, in some way, by the weather. Because of the latitude and altitude

alone Scotland suffers a harsher climate than the rest of the British Isles so certain economic activities are more marginal. For example, Scotland has a shorter growing season and a longer heating season than is found elsewhere in the country. Many of Scotland's major industries and other economic activities are highly weather sensitive. A significant percentage of Scotland's economy is directly or indirectly used to mitigate the socio-economic effects of climate variability. Many industries such as energy or insurance exist, at least in part, to smooth out the irregular burdens which the atmosphere imposes on society. Often, however, poor planning and social attitudes have tended to obscure some of the relationships and preclude the effective use of weather and climate information. In view of this the Climatic Hazards Unit is organising a major seminar in February 1988.

The purpose of this seminar is to demonstrate the benefits which result when decision-makers in weather-sensitive enterprises take advantage of existing information services. It also aims to encourage greater dialogue between the suppliers and consumers of weather services in order to mitigate weather sensitivity. The seminar is organised jointly by the Meterorological Office and the Climatic Hazards Unit at Stirling University. The Meteorological Office will explain how recent advances in atmospheric sciences are leading to improved forecasting techniques and the development of more specialised weather services, including the use of climatic data bases for long-term analysis. These produces will then be evaluated by major users with practical experience of operating weather-sensitive businesses and making investment decisions under climatic uncertainty. Contributions will describe current weather-related practices in transport, natural resources, energy, construction, and other industries in Scotland. In open discussion the seminar will seek to address key issues such as the real costs of Scottish weather, the need for better meteorological information, management limitations on weather precautions, and the scope for future progress. Report by Professor K. Smith

During 1987 Professor Smith has undertaken feasibility studies on weather impact for General Accident and British Rail. He also delivered the Royal Meteorological Society's annual talk to schools in Stirling (10th June) and Edinburgh (16th December). The former was postponed from January when bad weather prevented schools attending the talk which was titled appropriately "Weather Hazards: Can We Reduce the Risk?"

The Climatic Hazards Unit is considering offering regular annual schools lectures on aspects of weather extremes and would welcome comments from teachers on possible dates and topics.

5 Effects of Elevation

During 1987 the average difference in daily maximum air temperature between Stirling (Parkhead) and Ochil Hills (Carim) stations was 2.9°C which is equivalent to a lapse-rate of 9.76°C per 1000m. This compares with a 1981-87 average of 10.84°C per 1000m. That the difference during 1987 was lower

than the average was due, in part, to a higher frequency of more stable atmospheric conditions in which lapse-rates are lower. The average difference in minimum temperatures was 0.8°C, or a lapse rate of 2.69°C per 1000m, again lower than the average (3.94). The difference in mean temperature was 1.8°C, representing a lapse-rate of 6.06°C per 1000m one of the shallowest since the Ochil Hills station was established and considerably lower than the 6.5°C per 1000m normally used in climatological maps. The difference in annual precipitation between the two stations during 1987 was 577.7mm giving a gradient of change of 1.95mm/m. This compares with the 1981-87 average of 501.0mm or 1.69mm/m. Steeper precipitation gradients tend to be associated with slightly more stable atmospheres.

## 6 Cold weather allowances.

There has been much political debate about the payment of cold weather allowances in Scotland, some of which has been based on an incomplete grasp of the true nature of the Scottish climate. In the depth of winter minimum temperatures in south-east England are certainly as low as those in Scotland, due to a closer proximity to cold continental high pressure areas. Observations of grass surface temperature in the North Downs of Surrey (Harrison and Currie 1979) established the severity of microclimates developed in dry downland valleys, even during the summer months. Although over much of Scotland mid-winter temperatures tend to be lower than in England, there are the dual problems of length of winter or the heating season, which is between one and two months longer than in southern England, and the generally greater strength of the winds which accompany low temperatures. This latter 'wind-chill' factor is not accounted for in the current criteria for the payment of cold weather allowances yet only moderate increases in wind speed can drop the effective temperature by several degrees. For example, a temperature of - 1.0°C in calm air becomes -5.0°C at 10 mph and -9.4°C at 20 mph. Incorporation of a wind speed factor in the calculations would be a positive benefit to Scotland. Matthew Sully, an undergraduate student of Environmental Science at Stirling University, is currently assessing the probability of temperatures falling below fixed thresholds on single days, and over runs of several days. Calculated probabilities are considerably increased when temperatures are corrected downwards for wind-chill.

HARRISON, S. J. and CURRIE, I. 1979. A severe frost hollow on the North Downs, Surrey. *Journal Meteorology* 4(43) 265-70.

## 7 Bridge of Allan floods.

During 1987 Phillippa Rowling, an undergraduate student in Environmental Science, submitted her dissertation on the Bridge of Allan flood problem and has since graduated from the University. The work

was awarded the Association of British Climatologists' FHW Green Memorial Prize for the best UK dissertation in climatology in 1987. The conclusions, which draw attention to recent increases in heavy autumnal rainfalls, have been published in the local press.

The upward trend in annual rainfall totals in Stirling (See Note 7 in Issue 8) appears to have been checked in 1987 which had 904.2mm in comparison to the 1057.9mm, 1078.0mm and 1038.4mm of the last three years. It will be the end of 1988 before we can say whether or not this indicates a reversal of the recent trend towards higher totals. There were considerably fewer than usual heavy falls during 1987.

8 Atmospheric Pollution in the Severn Estuary

The Water Research Centre in Medmenham (Bucks.) is funding a three-year postgraduate studentship under the supervision of Dr Harrison, the principal aim of which will be to evaluate the atmospheric inputs of heavy metals and organic pollutants into the open waters of the Severn Estuary. Jacqueline Vale, formerly an oceanography student at Swansea University, has been awarded the studentship and will be starting work on the project in early January 1988.

9 Weather Station Siting Characteristics

During 1987 final checks were made on a new method of assessing weather station shelter and aspect. The results, which are to be published in *Weather* early in 1988, will hopefully provide a basis for discussion and lead to the development of methods for determining the true effect of local siting factors in meteorological data.

HARRISON, S.J. (in press). Numerical assessment of local shelter around weather stations. *Weather*.

10 Training Sessions for Teachers of Physical Geography

The department of Environmental Science is currently planning to hold full-day training sessions on the structuring of project work in physical geography, with particular reference to weather and soil study. It is likely that these will be held during May or June 1988. Teachers interested in attending should contact either Dr Harrison or Dr Davidson. Full details will be available in due course.

The Department may also be holding general Information Days for teachers and the University will be holding an Open Day during September, 1988.

11 Extra-Mural Study Courses on Weather

Two evening study courses, begun in 1987, are available again during 1988. Weather and Society (February 8th for eight weeks) considers the impact of weather extremes on society, and Watching the Weather (late

September for nine weeks) examines the methods by which weather observations are made. These courses are open to all. Enquiries should be addressed to the Continuing Education Department at Stirling University.

12 Reference Material

The Microclimatology Laboratory and the Climatic Hazards Room contain an increasing amount of reference material including climatic data (local, national, and global), synoptic weather data and scientific reports.

The Annual Climatological Bulletin is published in the *Forth Naturalist and Historian* back copies of which are available from its Editor/Secretary, L. Corbett c/o The University Library and from bookshops.

Monthly summaries of observations from Stirling (Parkhead) and Ochil Hills (Carim) stations can be accessed by University VAX users. The AWS data for Ochil Hills up to 1986 are available on magnetic tape.

Use of these data in publications should be acknowledged.

13 Publications During 1987

HARRISON, *S. J.* Stream temperatures at Howietoun Fish Farm. *Forth Naturalist and Historian* 9 25-37

HARRISON, S. J. Spatial and temporal variation in the precipitation-elevation relationship in the maritime uplands of Scotland, pp 117-33. *Proceedings of the International Symposium on Topodimatology and its Applications,* editor M. Erpicum, University of Liege, Belgium.

HARRISON, S. J. and PHIZACKLEA, J. Automatic weather station instrumentation: a System appraised. *Weather.* 42 218-221.

HARRISON, S. J. and PHIZACKLEA, A. P. Temperature fluctuation in muddy intertidal sediments. Forth Estuary, Scotland. *Estuarine, Coastal and Shelf Science* 24 279-88.

HARRISON, S. J. and PHIZACKLEA, A. P. Vertical temperature gradients in muddy intertidal sediments in the Forth Estuary, Scotland. *Limnology and Oceanography* 32 954-63.

SMITH, K. The climate of the Estuary and Firth of Clyde. *Proceedings of the Royal Society of Edinburgh.* 90B 43-54.

SMITH, K. Applied Climatology, pp 64-68 of J. E. Oliver and R. W. Fairbridge (editors). The Encyclopedia of Climatology. Van Nostrand Reinhold, New York.

Note

Single copies of the departmental form of the Annual Climatological Bulletin are available to schools free of charge. Further copies cost £1 each and are obtainable from the Department of Environmental Science at Stirling University.

| | Mean Maximum °C | Difference from Average | Highest Maximum | Lowest Maximum | Mean Minimum °C | Difference from Average | Highest Minimum | Lowest Minimum | Mean °C | No. days No. of <0°C | Mean Soil Temp. °C (0.3m at 09) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 3·7 | −2·0 | 10·0 | −3·2 | −2·4 | −2·3 | 4·1 | −7·5 | 0·7 | 26 | 1·4 |
| February | 6·4 | +0·3 | 11·6 | 1·6 | −0·3 | −0·6 | 6·4 | −6·6 | 3·0 | 26 | 1·4 |
| March | 7·1 | −1·4 | 11·0 | 2·2 | 0·2 | −1·3 | 6·3 | −5·5 | 3·7 | 15 | 3·3 |
| April | 12·9 | +1·3 | 22·2 | 6·3 | 4·3 | +1·2 | 9·0 | −1·2 | 8·6 | 1 | 7·7 |
| May | 14·1 | −0·7 | 19·0 | 9·9 | 5·4 | −0·1 | 9·8 | 1·0 | 9·7 | 0 | 11·8 |
| June | 15·6 | −1·7 | 20·8 | 11·8 | 7·1 | −1·1 | 12·9 | 3·3 | 11·3 | 0 | 13·9 |
| July | 20·0 | +0·2 | 24·5 | 16·1 | 10·0 | −0·8 | 14·5 | 6·3 | 15·0 | 0 | 16·6 |
| August | 19·0 | −0·1 | 22·3 | 14·8 | 9·7 | −0·2 | 16·0 | 3·5 | 14·3 | 0 | 16·4 |
| September | 15·7 | −0·2 | 20·7 | 11·8 | 7·7 | −0·5 | 12·3 | −0·3 | 11·7 | 0 | 14·4 |
| October | 10·9 | −1·7 | 15·7 | 5·9 | 4·2 | −1·2 | 10·4 | −5·3 | 7·5 | 5 | 9·8 |
| November | 8·4 | −0·4 | 14·2 | 0·2 | 3·4 | +0·9 | 8·6 | −4·5 | 5·9 | 4 | 6·9 |
| December | 7·3 | +0·3 | 12·5 | −2·4 | 2·5 | +1·1 | 7·4 | −6·5 | 4·9 | 10 | 4·3 |
| YEAR | 11·4 | −0·9 | 26·0 | − 0·5 | 3·7 | −1·1 | 15·4 | −9·2 | 7·6 | 85 | 8·4 |

Table 1 Monthly Temperatures (Stirling, Parkhead) 1987

| * = Some Missing Values | Mean Maximum °C | Difference from Average | Highest Maximum | Lowest Maximum | Mean Minimum °C | Difference from Average | Highest Minimum | Lowest Minimum | Mean °C | Difference Parkhead to Carim | No. days < 0°C |
|---|---|---|---|---|---|---|---|---|---|---|---|
| January * | 0·6 | −1·7 | 7·0 | − 6·8 | −2·6 | −1·1 | 3·1 | −11·2 | − 1·0 | 1·7 | 25 |
| February | 3·7 | +1·5 | 8·3 | − 1·5 | −1·4 | +0·4 | 6·0 | − 8·0 | 1·2 | 1·8 | 18 |
| March | 3·9 | −0·9 | 8·5 | − 0·5 | −1·5 | −1·5 | 4·0 | − 7·5 | 1·3 | 2·4 | 18 |
| April | 9·8 | +1·4 | 19·0 | 2·0 | 3.6 | +2·3 | 11·0 | − 2·0 | 6·7 | 1·9 | 2 |
| May * | 11·2 | −0·1 | 16·0 | 7·3 | 3·6 | −0·5 | 7·5 | 0·5 | 7·4 | 2·3 | 0 |
| June * | 12·2 | −1·4 | 17·5 | 8·0 | 5·6 | −1·3 | 11·0 | 2·0 | 8·9 | 2·4 | 0 |
| July | 16·1 | −0·3 | 21.0 | 12.0 | 8.7 | −0·5 | 13.0 | 4.0 | 12.4 | 2·6 | 0 |
| August * | 15·8 | +0·1 | 18·0 | 13·8 | 8·8 | 0·0 | 14·3 | 4·3 | 12·3 | 2·0 | 0 |
| September | 12·1 | −0·2 | 18·9 | 9·2 | 7·3 | +0·3 | 10·3 | 2·6 | 9·7 | 2·0 | 0 |
| October | 9·0 | 0 | 12·7 | 6·1 | 4·8 | +0·2 | 9.0 | 1·8 | 6·9 | 0·6 | 0 |
| November | 6·2 | +0·1 | 11·6 | 2·0 | 3·1 | +1·2 | 8·0 | − 4·0 | 4·6 | 1·3 | 3 |
| December * | 5.9 | +1.8 | 11.1 | 1.0 | 1·9 | +1·6 | 7·0 | − 4·2 | 3·9 | 1·0 | 11 |
| YEAR | 8.9 | 0 | 21·0 | − 6.8 | 3.5 | +0.1 | 14.3 | −11·2 | 6·2 | 1·8 | 77 |

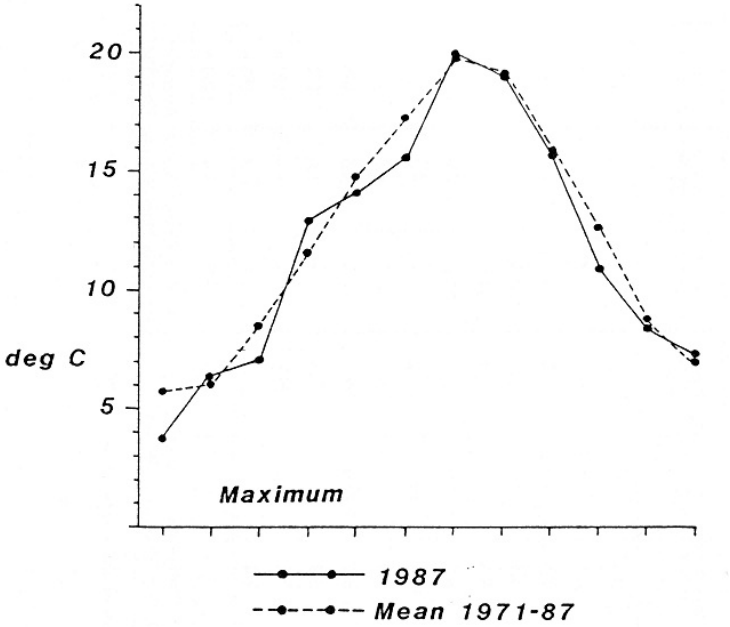
Table 2 Monthly Temperatures (Ochil Hills: Carim) 1987

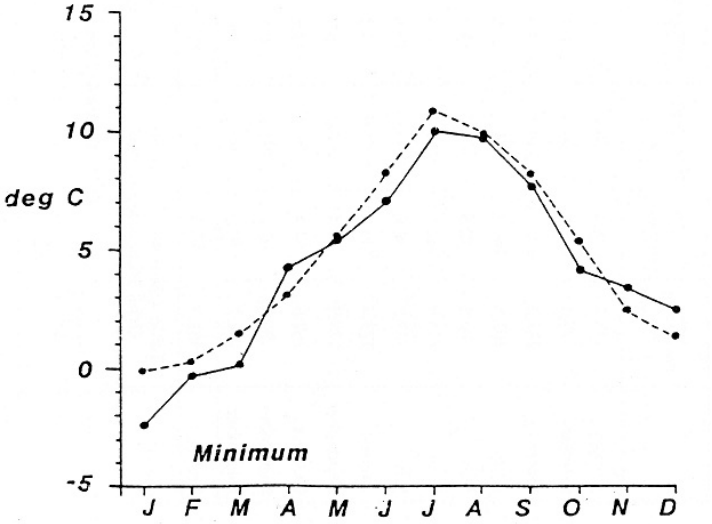
| | Total Precipitation mm | Percentage of Average | Percentage of Average Accumulated | Greatest fall in 24 hours | | Number of Days | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Amount (mm) | Date | Precipitation Recorded | 0·2mm or more | 1·0mm or more | 5·0mm or more |
| January | 72·6 | 72·2 | 72·2 | 18·2 | 1st | 14 | 13 | 12 | 5 |
| February | 53·0 | 99·4 | 81·6 | 20·1 | 9th | 14 | 12 | 7 | 2 |
| March | 96·1 | 119·8 | 94·7 | 21·7 | 26th | 20 | 20 | 15 | 5 |
| April | 58·6 | 148·4 | 102·4 | 23·0 | 10th | 12 | 12 | 10 | 3 |
| May | 32·4 | 51·9 | 93·1 | 11·5 | 29th | 10 | 10 | 8 | 3 |
| June | 88·6 | 159·9 | 102·5 | 22·4 | 4th | 18 | 16 | 13 | 6 |
| July | 58·2 | 103·6 | 102·7 | 9·4 | 14th | 16 | 14 | 11 | 6 |
| August | 102·6 | 155·2 | 109·4 | 30·0 | 15th | 18 | 17 | 10 | 7 |
| September | 72·0 | 73·2 | 103·6 | 14·4 | 11th | 19 | 18 | 15 | 5 |
| October | 115·1 | 124·7 | 106·4 | 17·2 | 7th | 22 | 22 | 15 | 9 |
| November | 60·6 | 55·2 | 99·5 | 13·6 | 11th | 14 | 14 | 10 | 5 |
| December | 94·4 | 93·0 | 98·8 | 18·3 | 27th | 15 | 15 | 14 | 7 |
| Year | 904·2 | 98·8 | – | 30·0 | 15th/8th | 192 | 183 | 140 | 63 |

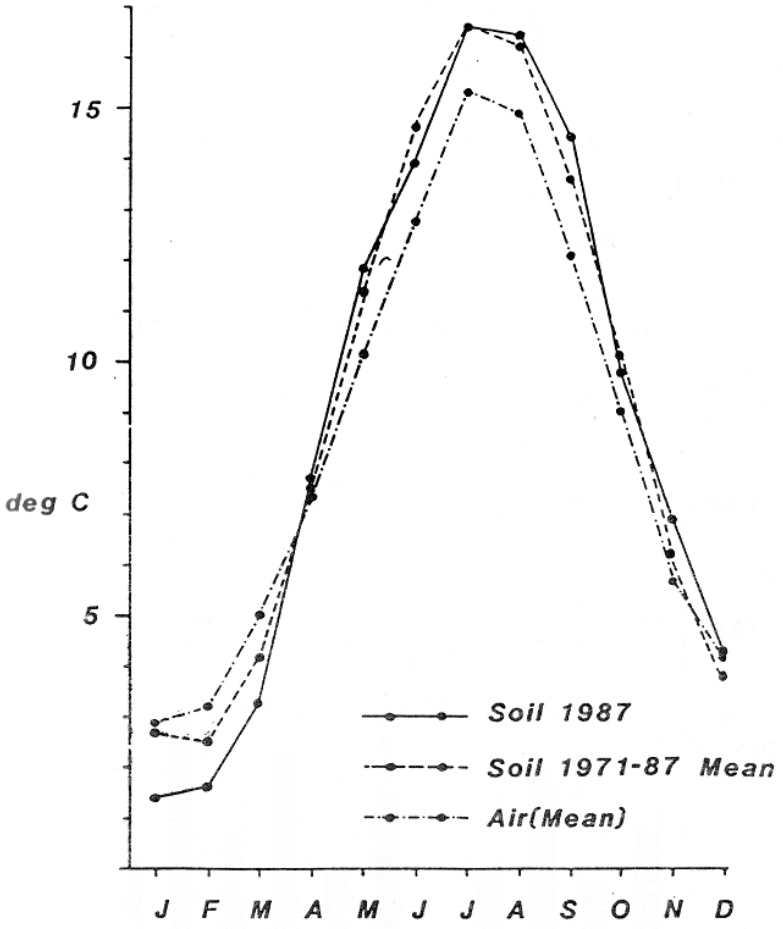
Table 3. Monthly Precipitation (Stirling: Parkhead) 1987

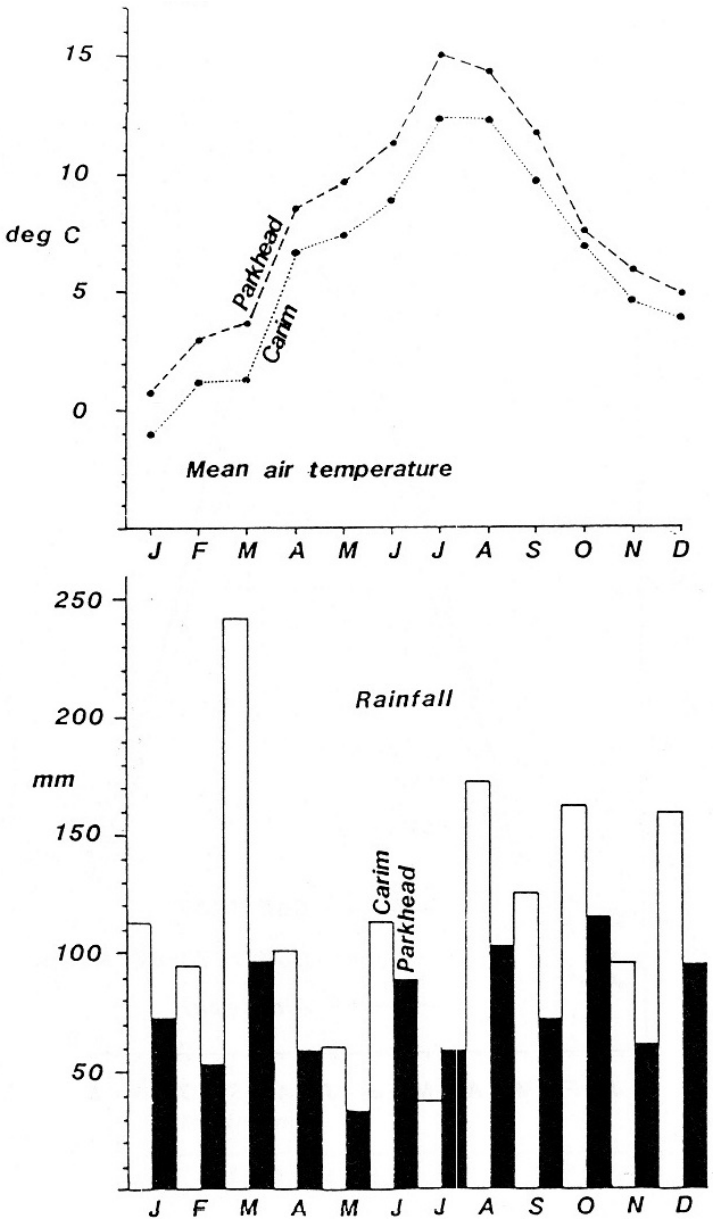
| | Total Precipitation mm | Percentage of Average | Percentage of Accumulated Average | Maximum Temperature °C | Minimum Temperature °C | Soil Temperature (0.3m at 09.00°C) | Total Precipitation mm | Maximum Temperature °C | Minimum Temperature °C | Total Precipitation mm |
|---|---|---|---|---|---|---|---|---|---|---|
| January | 113.1 | 78.4 | 78.4 | 5.7 | – 0.1 | 2.7 | 100.6 | 2.3 | –1.5 | 144.2 |
| February | 95.4 | 134.0 | 96.8 | 6.1 | 0.3 | 2.5 | 53.3 | 2.2 | –1.8 | 71.2 |
| March | 242.5 | 147.5 | 118.7 | 8.5 | 1.5 | 4.2 | 80.2 | 4.8 | 0.0 | 164.4 |
| April | 101.6 | 160.3 | 124.7 | 11.6 | 3.1 | 7.5 | 39.5 | 8.4 | 1.3 | 63.4 |
| May | 60.4 | 52.8 | 109.9 | 14.8 | 5.5 | 11.4 | 62.4 | 11.3 | 4.1 | 114.5 |
| June | 113.9 | 142.6 | 114.0 | 17.3 | 8.2 | 14.6 | 55.4 | 13.6 | 6.9 | 79.9 |
| July | 37.5 | 56.6 | 108.6 | 19.8 | 10.8 | 16.6 | 56.2 | 16.4 | 9.2 | 66.2 |
| August | 173.4 | 145.1 | 113.9 | 19.1 | 9.9 | 16.2 | 66.1 | 15.7 | 8.8 | 119.5 |
| September | 125.9 | 74.4 | 107.2 | 15.9 | 8.2 | 13.6 | 98.4 | 12.3 | 7.0 | 169.3 |
| October | 162.5 | 94.1 | 105.2 | 12.6 | 5.4 | 10.1 | 92.3 | 9.0 | 4.6 | 172.6 |
| November | 96.0 | 67.2 | 101.1 | 8.8 | 2.5 | 6.2 | 109.7 | 6.1 | 1.9 | 142.8 |
| December | 159.7 | 85.5 | 99.1 | 7.0 | 1.4 | 3.8 | 101.5 | 4.1 | 0.3 | 186.8 |
| YEAR | 1481.9 | 99.1 | | 12.3 | 4.7 | 9.1 | 915.6 | 8.9 | 3.4 | 1494.6 |
| | Table 4 Monthly Precipitation Ochil Hills (Carim) 1987 | | | Table 5 Climatological Averages for Stirling (Parkhead) 1971-87 | | | | Table 6 Climatological Averages for Ochil Hills (Carim) 1981-1987 | | |

Tables 4, 5 and 6 Rainfall and temperatures, 1987

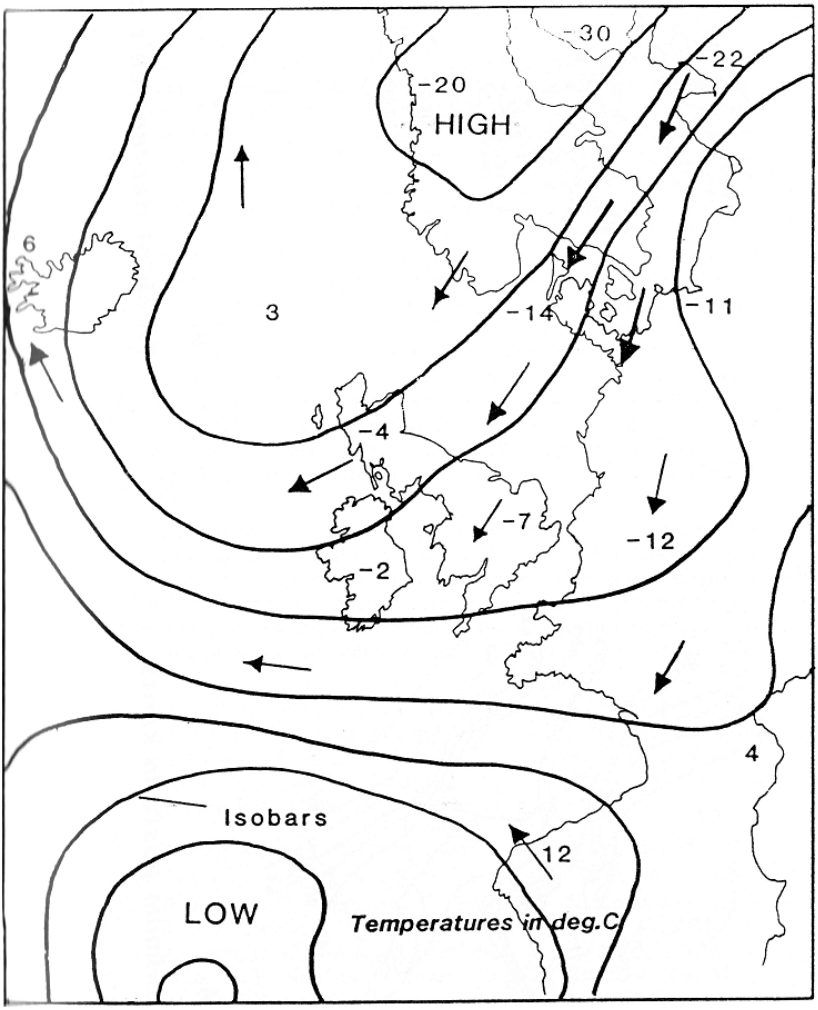

20
15
10
deg C
5
Maximum
1987
Mean 1971-87


15
10
deg C
5
0
-5
Minimum
J F M A M J J A S O N D


15
10
5
deg C
Soil 1987
Soil 1971-87 Mean
Air(Mean)
J F M A M J J A S O N D




**CENTRAL REGION** BIRD **REPORT** 1987




*C.* J. Henty
University of Stirling

The recent redrawing of the boundaries of the bird recording areas in Scotland (for ourselves, Central Region excluding Loch Lomondside) has highlighted the fact that there is no checklist available for the local area. I have produced a provisional checklist with very abbreviated descriptions of status and have become aware of the scanty information available for two

parts of the area that have only just come within the scope of these reports. The first is the highland area in the northern part of Central Region - the Ben Lui massif and the little visited hills between Glen Dochart and Glen Lochay. Better information for these places could significantly change the apparent status of species that breed in the hills. The second is in the extreme southeast of Central Region where the coastal stretch from Bo'ness to Blackness has been allocated to us out of the old county of West Lothian. The Lothian bird reports from 1979 make it clear

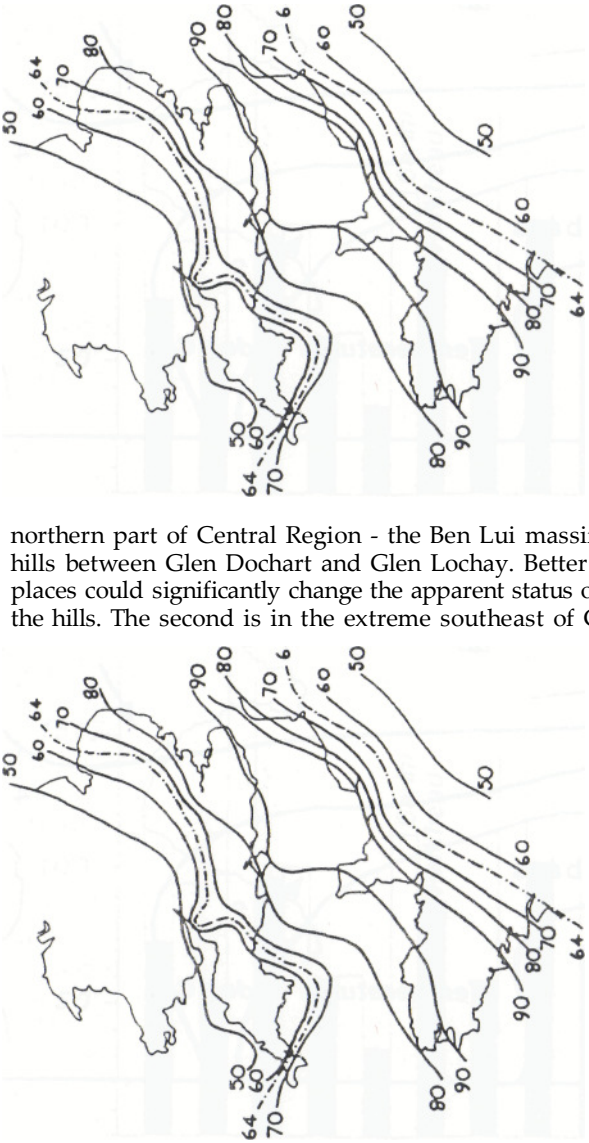



Figure 5 The October storm 1987

that wintering divers, Red-necked Grebes and sea duck are much commoner here than higher up the Forth; once more, some systematic observation could make a definite impact on status in Central Region. A new species for the region came to light since the Lothian Bird Report for 1983 reported a Black Guillemot at Blackness on 28th August.

Notable records for 1987 particularly concern waders. Little Ringed Plovers attempted to breed - only the second time in Scotland. The first local record this century of Purple Sandpiper came from the Lake of Menteith (an unusual habitat) whilst there were Pectoral Sandpipers reported in both spring and autumn, Dotterel on spring passage and a breeding plumage Temminck's Stint was photographed on Loch Tay in July.

A potentially serious habitat change became imminent when the work was completed on the raising of the dams at Carron Valley Reservoir. However, at the time of writing, this has not so far led to a permanent raising of the water level and the breeding populations of waders and the wintering Bean Geese have not yet been affected.

The following observers, noted by initials, contributed to this 1987 list -

P. W. Atkinson, R. A. Broad, D. M. Bryant, M. V. Bell, W. R. Brackenridge, E. D. Cameron, C. Crawford, Nature Conservancy Council, D. L. Clugston, H. Dott, A. Henty, C. *J.* Henty, G. *J.* Fitchett, G. T. Jamieson, D. C. Jardine, D. Matthews, A. B. Mitchell, J. Mitchell, J. S. Nadin, S. F. Newton, H. Robb, R. A. B. Shand, S. and M. E. Shimeld, P. Stirling-Aird, P. Taylor, M. Thomson, D. Thorogood, M. Trubridge, A. Van Beest, A. D. Wood.

Falkirk and Clackmannan Districts are indicated by the marginal F and C, *S* refers to the old Stirling County part of Stirling District and SWP refers to the Perth part of Stirling District.

## SYSTEMATIC LIST

RED-THROATED DIVER

S 1 Carron Valley Reservoir 16th September (ADW)

SWP 1 on Loch Venachar in summer (HD). 1 Loch Katrine (E) 22nd July (WRB). Pair bred near Killin, 1 young, 19th June (WRB)

BLACK-THROATED DIVER

S 1 Carron Valley Reservoir 15th February (ADW)

SWP At usual site on a western loch: 1st on 22nd March, 2 on 27th. Clutch 2 on 5-6th May; eggs disappeared 18/19th May. 3 birds on 14th April and 19th June (last) (MT)

LITTLE GREBE

S Airthrey: 1st heard 4th March; 5 pairs (2 arrived late in summer), 20 young fledged from 9 broods — 1 pair reared 8 young from 3 broods. 3 broods hatched in late August (MVB)

GREAT CRESTED GREBE

Forth estuary: 271 on 15th February and 156 on 10th September (DMB)

F Kinneil: 126 on 7th February and 140 on 21st, 40 on 16th July and 60 on 27th; 113 on 3rd August, 117 on 8th, 181 on 22nd and 225 on 30th; 400 on 29th September, 200 on llth October, 147 on 4th November (MVB DCJ GJF CJH DT). 45 Bo'ness 19th August (WRB)

C Pair nesting Gartmorn mid June (WRB)

S 3 pairs Carron Valley Reservoir, 2 young reared (ADW). Pair Loch Coulter 13th September (WRB)

SWP Pairs Loch Venachar and Loch Watston 22nd March (DT)

RED-NECKED GREBE

F 9 Blackness 16th February and 4 on 17th April and llth October (Lothian Bird Report)

GANNET

F 1 Kinneil 12th September; 1 juvenile Grangemouth 10th September and 3 on 14th (DCJ MVB)

CORMORANT

262 on Forth estuary 20th December (DMB)

F 120 Grangemouth 29th December (DCJ), 236 Skinflats 20th December (MVB)

C 146 at South Alloa roost 28th October (CJH)

S 3 Carron Valley Reservoir 28th February and 3 on 3rd October. 1 Airthrey 21st October to end year (MVB)

SHAG

F 1 Grangemouth 6th December (DMB)

GREY HERON

SWP 20 nests Lake of Menteith - 18 occupied on 25th May (RB)

MUTE SWAN

73 on Forth estuary 20th December (DMB)

C Adult female at Alva 10-20th March had been colour ringed as cygnet at Montrose on 5th September 1982, not detected since then (SFN).

6 fed with Whoopers on farmland near Alva January-March (AH)

S Pair at Airthrey hatched 8 and fledged 7 (MVB)

WHOOPER SWAN

F 2 Kinneil 24th January (DCJ)

C 30 Alloa (Helensfield) 8th December to end year (AH)

S Carron Valley Reservoir: 5 on 14th February and 21st, 2 on 26th December (MVB DT). 12 (2 juvenile) North Third Reservoir December 5th (ABM) and 22 on 13th (WRB)

SWP Thornhill: 116 on 21st January and 107 on 24th, 49 on 15th March

and 39 on 28th, last 6 on llth and 16th April (DT MVB RB). 1st of autumn 7 on 10th October, 131 on llth November (per D. Bayne), 137 (27 juvenile) on 15th and 165 on 21st Fewer in December — 27 on 19th
42 (8 juveniles) Blairdrummond 15th November (RB DT), 30 Ashfield 20th November (WRB)

BEWICK SWAN

SWP 4 (2 juveniles) Loch Watston 15th November (RAB D. Burges). 3 adults with Whoopers at Thornhill 21st November (DT)

PINK-FOOTED GOOSE

F 1000 Skinflats January 3rd and 930 on llth, 120 Kinneil February 3rd (DCJ MVB)

S 90 N Bridge of Allan 08.20 on April 26th, 70 W at Airthrey May 13th (DMB CJH). 30 E Bridge of Allan 14.10 on September 26th and 60 S 11.40 on December 6th (CJH). 1000 Arnprior 5th November (PWA), 590 NW Airthrey November 19th (MVB)
1 with Bean Geese at Carron Valley Reservoir on November 29th (DLC), 1st date 9 on 13th September (ADW)

SWP 1500 Blairdrummond 21st February and 3350 Thornhill on 22nd; 1300 Coldoch 12th April, 5070 (roost) at Lake of Menteith on 23rd and 450 feeding there on 4th May (RAB DT). Leucistic birds at Blairdrummond on 21st February and Thornhill on 22nd March (DT)
Total of 2185 on Carse of Stirling 15th November with 1800 at Lake of Menteith (RAB). 1200 Kippen 1st December (WRB). On 13th December 1000 on Carse of Lecropt, 600 Kippen and 900 Loch Watston (DT)

GREYLAG GOOSE

F 65 Kinneil 24th January (DCJ). 24 Loch Elrig 7th November (RAB)

S 75 Loch Coulter 21st February (MVB), 400 on 26th November (WRB)

SWP 650 Blairdrummond 28th February; at Thornhill 670 on 28th March, 980 on 4th April and 710 on llth (MVB)
Only 87 in goose count on Carse of Stirling 15th November (RAB)

WHITE-FRONTED GOOSE

SWP 2 (Greenland form) Blairdrummond 21st February (DT)

BEAN GOOSE

F Loch Elrig: 64 on 16th October, 122 on 5th December (ADW)
(38 possibles flying W near Loch Elrig 5th November (RAB)]

S Carron Valley Reservoir: 27 on 14th February, 102 on 21st and

105 on 22nd and 28th. 46 on 13th September, 64 on 3rd and 4th October, 80 on llth and 83 on 13th, 15 on 6th November, 95 on 29th (MVB WRB DLC DCJ ADW)

CANADA GOOSE SWP 1 Lake of Menteith 5th May (RAB)

BARNACLE GOOSE

S 1 Carron Valley Reservoir 3rd October (MVB ADW). 3 Kippen 1st December (WRB)

SWP 7 Lake of Menteith 15th November and 1 on 10th December (RAB)

BRENT GOOSE

F 1 (pale breasted) at Kinneil 28th June (RS)

SHELDUCK

1568 Forth Estuary on 20th December (DMB)

F Kinneil: 443 on 2nd July and 1050 on 12th, 1264 on 6th August and 1600 on 19th, 2365 ( + 100 Skinflats) on 21st August and 2600 on 22nd, 1404 on 10th September (DMB MVB GJF SFN PT DT WRB)

Skinflats: 502 on llth January, 324 on 15th February, 312 on 10th September, 219 on 20th December (MVB)

C 2 pair Cambus 22nd April (WRB)

WIGEON

620 Forth Estuary 16th January (DMB)

Skinflats: 281 on 11th January, 26 on 15th February, 2 on 10th September (MVB). 528 Blackness 21st November (Lothian Bird Report)

C Female Lower Glendevon Reservoir 17th June (CJH)

175 Gartmorn 13th February (95% frozen) (MVB)

S 1 Airthrey 8th September (MVB). Carron Valley Reservoir: 107 on 14th February and 87 on 21st (when 90% frozen), 93 on 10th October (DCJ MVB). 46 Loch Coulter 13th December (WRB)

SWP Male Cromlix 19th May (WRB)

GAD WALL

SWP Male Cromlix 19th May (WRB)

TEAL

820 Forth Estuary 20th December (DMB)

F Kinneil: 1000 on 10th January, 250 on 1st February, 150 on 21st March, 124 on 22nd August, 340 on 29th September, 400 on 11th October, 500 on 27th November, 817 on 20th December (MVB CJH DCJ SFN RBS DT)

C Small numbers on burns round Upper Glendevon Reservoir in early May, female with brood on 24th. 3 males and 1 female

Lower Glendevon Reservoir 17th June (CJH SFN). On Menstrie and Alva Mosses in May/June (NCC). 80 Gartmorn 15 February (MVB)

S Carron Valley Reservoir: 75 on 21st February and 206 on 3rd October (MVB). 150 Upper Touch Reservoir 13th November (CC). On Earls Hill and Gargunnock Hills in May/June (NCC)

MALLARD

1392 on Forth estuary 15th February (DMB)
Kinneil: 481 on llth January, 517 on 15th February, 76 on 22nd August, 73 on 10th September, 140 on 4th November (MVB GJF). 130 Skinflats 22nd August (MVB)
710 Gartmorn 15th February (MVB)
Carron Valley Reservoir: 421 on 14th February and 404 on 21st, 514 on 15th March, 156 on 3rd October (MVB DCJ ADW). 190 Kippen Muir 22nd November (DT), 156 Upper Touch Reservoir 11th December (CC).
At Airthrey 22 broods totalling 158 young between 23rd April and 13th July, 110 fledged. 277 on 8th September (MVB)
304 Loch Venachar 25th January (DT)

PINTAIL

F Kinneil: 36 on llth January, 48 on 15th February, 5 on 4th October (MVB DCJ). Male Pintail-Mallard hybrid on 4th January and 30th December (DCJ)

S 1 Airthrey 10th February, 1 Kippen Muir 22nd November. 2 Carron Valley Reservoir 3rd October (MVB DT)

GARGANEY

C Male Cambus Pool 22nd April (WRB DCJ)

SHOVELER

F 8 Kinneil 21st August (DMB)

C Male Cambus 22nd April (WRB)

POCHARD

F Pair Skinflats 29th April (DCJ), 1 on 20th December (MVB)

C 76 Gartmorn 15th February (MVB)

S Maximum of 7 Airthrey in November. 4 Carron Valley Reservoir 21st February (SFN MVB) SWP

34 Loch Achray 22nd February (DT)

TUFTED DUCK

F Kinneil: 5 on 10th January and 4 on 15th February (MVB DT)

C 99 Gartmorn 15th February (MVB).
Female on River Devon above Cambus 9th June (CJH)

S Airthrey: 9 paris bred, 8 broods totalling 64 young - probably 43 fledged. 34 on 2nd November and 47 on 24th, 32 on 12th December (MVB).

A pair Upper Touch Reservoir 30th June (NCC).
31 Carron Valley Reservoir 3rd October (MVB)
70 Lake of Menteith 15th November - large count (RAB)

SCAUP
F Kinneil: 3 on 4th January and 4 on 7th February; 11 on 11th October, 10 on 4th November and 25 on 6th December. 1 Skinflats on 3rd October (DMB GJF CJH DCJ)

GOLDENEYE
239 on Forth estuary 15th February (DMB). Elsewhere Numbers were mainly small (Editor)
C 46 Gartmorn 15th February (MVB)
S 2 Carron Valley Reservoir 27th September - 1st autumn record (ADW)

SMEW
SWP Female at Lake of Menteith 20th January and 14th February, Loch Voil 3rd February and Loch Venachar on 22nd (RAB DT A Hulme)

RED-BREASTED MERGANSER
Forth estuary: 42 on 15th February and 42 on 20th December (DMB)
F 10 Kinneil llth January and 14 on 15th February (MVB)
SWP 12 Lake of Menteith 28th January. At Loch Venachar in summer, bred Ashfield (brood of 4 in July-August) (WRB HED)

GOOSANDER
C 5 on Devon at Alva 5th April, female with brood Dollar 21st June, 2 females above Upper Glendevon Reservoir and female with 6 small young Lower Glendevon Reservoir 17th June (CJH SFN)
SWP 42 (23m) Lake of Menteith 20th January, 12 on 28th; pair Loch Arklet 28th April (RAB). Bred Kilmahog, Loch Voil (WRB)

IIHN HARRIER
Male Kippen Muir 12th September (DT). Pair Touch Muir 27/28th September (AVB)
SWP 1 Keltie Water (Callander) 13th December, flew high E at dusk (ABM).
1 Cairnston, Dunblane llth October (MVB). 2 males Braes of Doune mid July (WRB)

SPARROWHAWK
F Adult male Kinneil 17th January and 3rd September (DCJ). 1 Skinflats 15th February, 1 on llth October hunting along tidebank (MVB CJH)
S 1 Airthrey 10th February, 20th June, 14th August, 8th September (MVB)

SWP 1 Kenknock plantation Glen Lochay 25th May (EDC)

BUZZARD

C Scarce - near Muckhart 28th August, 6th October, adult and 2 juvenile 4th September (SFN); 4 on 8th February (DMB). 1 Alva Moss 7th June (NCC)

S Seen in Fintry Hills May/June (NCC)
SWP 1 Doune 20th September, 1 Lecropt 12th October (ABM). No reports on extensive resident populations in N and W of Region (Editor)

MERLIN

F 1 Kinneil 17th January, 1 Grangemouth 28th November and 6th December (DMB DCJ)

C Male Alva 24th March (SFN). Pair Alva Moss 14th April (NCC)

S 1 Airthrey 7th January (DMB)

PEREGRINE

Central Region: Of 23 sites, 2 were unoccupied, single birds present at 3 and pairs at the rest. All pairs attempted to nest, 8 were successful with 21 young reared (JM PSA).

The young were taken from one of the unsuccessful nests (JM). Prey killed by one pair included juvenile Kestrel and Sparrowhawk (SFN).

A nestling ringed on Loch Lomondside in 1985 was found shot at Loch Thorn (Renfrew) on 8th June 1987 (per RAB)

F 1 Skinflats 7th November (DCJ)

RED GROUSE *SIC* In summer present in relatively high density on Earls Hill but low densities on Fintry Hills, Gargunnock Hills, Menstrie Moss and Alva Moss (NCC)

S 8 in 6 km on N. Gargunnocks 6th December (CJH)

PTARMIGAN

SWP 1 on summit Meall a Churain Glen Dochart NN463325 25th May (EDC).
1 Sgiath Chuil 27th May and 2 on 7th June (WRB)
The exact distribution is poorly known (Ed)

BLACK GROUSE

C On Menstrie Moss in summer (NCC)

S On Fintry Hills in summer (NCC)
2 males Balglass Corrie 21st June (DCJ)

SWP Near Aberfoyle in summer (HEMD)
6 Milton Glen (Callander) 1st March (DW)

CAPERCAILLIE

SWP Near Aberfoyle in summer (HEMD); Male and 5 female at Lek (display) Drumore Wood 20th April, 2 females with broods on llth June - after orienteering event (WRB)

GREY PARTRIDGE SWP 13 Ashfield 19th October (WRB)

REDLEGGED PARTRIDGE SWP 2 to 5 on Carse of Lecropt May-June (DMB)
1 dead near Auchrioch, Crianlarich, mid April (JM)
3 Doune 7th June (RBS). Reported in gardens at Glen Road Bridge of Allan October-November (WRB)

WATER RAIL
F 6 Carron Dam 17th January (RBS)
C 1 Cambus 18th January (WRB)

MOORHEN
S 9 pairs fledged 30 young at Airthrey; Max 20 on 1st January and 25 on 1st October (MVB)

270 Gartmorn dam 15th February (95% frozen) (MVB) 20 pairs fledged 41 young Airthrey; max 58 on 1st January, 69 on 1st and 22nd October (MVB) SWP 342 Lake of Menteith 15th November (RAB)

OYSTERCATCHER
970 on Forth Estuary, 15th February (DMB)
F 70 Kinneil 4th January and 7th February (DCJ). 1 there on 30th July had deformed bill, like a curlew in length and shape, fed by probing in mud (DT)
C 1st of spring over Alva 27th February, in fields 3rd March (SFN)
S 1st **of** spring over Stirling on 16th February (DT)
1 Airthrey 10th February, 1 Carron Valley Reservoir 28th February (MVB)
SWP 100 Drip bridge 17th March (DT)
Small numbers very high to SW at Dunblane evening of 19th July (MVB)

RINGED PLOVER
48 on Forth Estuary, 16th January (DMB)
F 16 Kinneil 17th May, young reared in June. 1 Loch Elrig 13th September (DCJ), 61 Bo'ness 10th September (SFN)
C Pair plus bird at another site, Upper Glendevon Reservoir 17th June (CJH)
S 2 pairs Earlsburn Reservoir 12th April (DT). 16 pairs Carron Valley Reservoir (ADW)

LITTLE RINGED PLOVER

2 on 6th May-28th June, 1 on 30th June and 1st July. Distraction displays seen but no young, likely nesting area bulldozed on 2nd July (DCJ GJF RAS)

DOTTEREL

C Pair Ben Cleuch 24th May (WRB)

GOLDEN PLOVER

365 on Forth Estuary, 20th December (DMB)
80 Kinneil 22nd August, 176 Bo'ness 26th August; 200 Skinflats llth October and 160 on 20th December (MVB CJH PT)

C 9 pairs in 618h Alva Moss. 2 pairs in 671h Menstrie Moss (NCC)

S Fintry Hills 2 pairs in 602h; Gargunnock Hills 2 pairs in 707h; Earls Hill 3 pairs in 687h (NCC) SWP 66 Blairdrummond 7th March, 55 Thornhill 16th April (DT)

1 on summit of Meall a Churain NN463325 25th May (EDC)

GREY PLOVER

F 14 Skinflats 14th January and 26 on 24th (MVB DCJ)

LAPWING

1172 Forth Estuary 20th December (DMB)

F Kinneil: 200 on 4th January and 4th October, 470 on 22nd August, 230 on 30th December. Skinflats: 280 on 22nd August, 385 on 10th September (MVB DCJ)

C 1st brood 22nd May, 200 in burnt stubble Alva 27th September (SFN)

KNOT

4368 Forth Estuary 20th December (DMB)

F Kinneil: 900 on 4th January, 2 on 7th July, 4045 on 20th December (DCJ SFN)

SANDERLING

F 3 Kinneil 22nd August (MVB)

TEMMINCK'S STINT

SWP 1 on shore at west end of Loch Tay 12th July. An adult in summer plumage - colour photographs and description of flight pattern supplied (S. Spring)

CURLEW SANDPIPER

F 1 Skinflats 17th May in red plumage. 1 Grangemouth 30th September and 3 on 3rd October. 2 Kinneil 18th October (DCJ)

PURPLE SANDPIPER

SWP 1 Lake of Menteith 15th November (RB D. Burges). Close views of the bird as it frequented a stretch of small rocks and shigle at the water's edge, also seen in flight. The habitat seemed incongruous to the observers but the bird seemed quite at home.

DUNLIN

4614 on Forth Estuary 20th December (DMB)

F Kinneil: 2000 on 1st February, 965 on 15th. Skinflats: 2900 on llth January, 2050 on 15th February, 57 on 10th September (MVB DCJ SFN)

PECTORAL SANDPIPER

F 1 Kinneil 8, 9 and 12th September (DCJ W. Prest JSN)

C 1 Cambus 24th and 25th May (R. McNab DCJ)
Detailed descriptions, submitted by DCJ, include such features as yellowish legs, size about 30% larger than Dunlin, pale supercilium and 'braces' streaks on mantle, distinct pectoral band due to dark streaks on breast, flight call a harsh 'krritt'. The Scottish Rare Birds Committee has accepted both records.

RUFF F

Kinneil: 1 on 3rd August, 2 on 8th, 1 on 22nd, 4 on 30th; 5 on 3rd September, 7 on 6th. Skinflats: 2 on 29th April, 4 on 10th September (MVB SJF DCJ RBS DT)

JACK SNIPE

F Kinneil: 2 on January 2nd and 10th, 6 on 17th and 3 on 24th;
1 on 1st February, 3 on March 21st and 2 on 23rd. 1 on llth C

October, 2 on 27th November, 1 on 30th December (RAB CJH DCJ RAS DT)
1 Alva Moss 7th May (NCC). (Unusual habitat and late date, Editor)

Kinneil: 29 on 2nd January, 13 on 13th August, 15 on 8th September, 40 on llth October, 52 on 27th November, 36 on 30th December (CJH DCJ RAS)
Skinflats: 1 on llth January (MVB)

C 5 pairs Menstrie Moss, 2 pairs Alva Moss (NCC)

S 1 Kidlaw (W Ochils) 13th December - in open ditch at 520 metres during hard frost (CJH).
2 pairs Earl's Hill, none on Gargunnock Hills (NCC)

WOODCOCK

S Roding birds at Abbey Craig, Plean (WRB)

SWP Roding Dunblane (Newton Crescent) 23rd April to 12th July (MVB)

BLACK-TAILED GOD WIT

F Kinneil: 2 on February 2nd, 3rd and 7th, 2 on 10th March, 1 on 10th June, 1 on 12th July, 6 on 27th, 4 on 28th and 8 on 31st; 13 on 1st August, 3 on 8th, 6 on 21st and 12 on 30th; 5 on 6th September and 11 on 12th; 8 on 4th October, 19 on 1st November and 7 on 4th; 7 on December 6th and 1 on 30th (DMB GJF DCJ JSN RAS DT) Skinflats: 2 on 7th May and 1 on 17th (RAS DCJ)

BAR-TAILED GODWIT

196 on Forth Estuary 17th January (DMB)

F 50 Kinneil 4th January, 17 on 24th. 1st of autumn 1st August (DCJ)

WHIMBREL

F Kinneil: 2 on 8th May and 3 on 10th. 1 on 17th June, 11 on 1st July, 2 on 12th and 15th, 7 W on 16th and 3 W on 28th; 1 on 22nd August and 7 on 31st; 1 on 3rd September and 11 on 12th; 1 on 4th October (MVB GJF DCJ JSN DT) Skinflats: 5 on.29th April, 4 on 7th May and 1 on 17th (DCJ)

CURLEW

F 953 on Forth Estuary 15th February (DMB)
Kinneil: 93 on 10th March and 200 on 21st; 120 on 1st July and 400 on 12th, 438 on 10th September (GJC DCJ SJN DT)

C 24 by Devon Vicar's Bridge 18th March (SFN) Menstrie Moss 9 pairs in 671h; Alva Moss 4 pairs in 618h (NCC)

S Fintry Hills 4 pairs, Gargunnock Hill 7 pairs, Earls Hill 16 pairs (2.3/km) (NCC) SWP

SWP 1st of spring at Dunblane 27th February (MVB)

SPOTTED REDSHANK

F 1 Skinflats 5th and 9th September, 2 Kinneil 4th October and 1 on 18th, 1 Grangemouth 30th December (DCJ JSN RAS)

C 1 Cambus Pool 1st June (DCJ)

REDSHANK

2104 on Forth Estuary 20th December (DMB)

F Kinneil: 350 on 10th March and 500 on 21st, 820 on 22nd August, 350 on 4th November (MVB SJF DCJ) Skinflats: 1140 on 11h January, 790 on 15th February, 162 on 22nd August, 445 on 10th September (MVB)

GREENSHANK

F Kinneil: 1 on 17th May, 1 on 28th June, 1 on 15th and 16th July, 8 on 22nd August.

Skinflats: 1 on llth June, 5 on 27th July, 15 on 13th August and 12 on 14th, 3 on 5th September. 3 Loch Elrig 13th September (DMB MVB GJF DCJ JSN RAS)

GREEN SANDPIPER
F 2 Kinneil 13th and 16th August, 1 on 14th and 15th August (DCJ JSN)

WOOD SANDPIPER
S 1 Carron Valley Reservoir 23rd July (AW)

COMMON SANDPIPER
F Kinneil: 1 on 20th April, 4 on 2nd and 27th July, 7 on 16th and 9 on 28th.
Skinflats: 4 on 2nd August and 6 on 7th (GJF DCJ JSN)
C 1 Muckhart 18th April and 6 at Cambus on 22nd (DMB RAS). 7 territories around Upper Glendevon Reservoir 16th May (SFN). 1 Cambus 21st November (ABM)
S 1 Airthrey 15th May and 24th July (MVB). 29 pairs Carron Valley Reservoir (ADW)
SWP 1st Loch Voil 2nd May (DT)

TURNSTONE
88 on Forth Estuary on 15th February (DMB)
F 2 Grangemouth llth January and 11 on 15th February (MVB)

POMARINE SKUA
F 2 Kinneil 4th October (DCJ)

ARCTIC SKUA
F Kinneil: 2 on 30th August, 1 on 6th and 9th September (DCJ DT)

BLACK-HEADED GULL
S 12 pairs Gargunnock Hills (NCC). 84 pairs Carron Valley Reservoir (ADW)

COMMON GULL
C 35 around island at Upper Glendevon Reservoir 17th June (QH) SWP 8 on nests in joints of hydro pipeline in Glen Lochay, 25th
May (EDC)

LESSER BLACK-BACKED GULL
F 5 Skinflats 1st November and 15 on 7th (DCJ)
S 1 Stirling 7th March (DT)
SWP 4 Coldoch 15th November (RAB). (Information urgently required on breeding colony on Flanders Moss, Editor)

HERRING GULL
F 5000 Kinneil 24th January (DCJ)

ICELAND GULL
F 1 (1st winter) Kinneil 12th February (GJF)

GLAUCOUS GULL
F Kinneil: 1 on 7th January, adult on 10th January and 1st, 3rd and 15th February. 1st winter on 4th February (MVB GJF DCJ RAS DT)

GREATER BLACK-BACKED GULL
F 113 Kinneil 10th January (DCJ)

KITTIWAKE
F Kinneil: 60 W on 21st March, 1 on 15th July and 20 W on 27th, 8 on 22nd August (MVB DCJ DT)
S 70 W at Carron Valley Reservoir 16th October (ADW)

SANDWICH TERN
F Kinneil: 20 on 15th August and 150 on 6th September (DCJ). 78 Blackness 21st September (Lothian Bird Report)

COMMON TERN
F 1 Kinneil 8th May. Skinflats: 11 on 22nd August, on 14th 12 landed on the pools then flew W inland (MVB GJF JSN)
C Pair Upper Glendevon Reservoir 17th June (CJH)

BLACK TERN
F 1 Kinneil 1st August (DCJ)

GUILLEMOT

F Skinflats: 4 on 10th September, 10 on llth October - flying over mudflats (MVB CJH)
S 1 fresh dead (plucked) Kippen Muir 3rd October (JSN)
SWP 1 Lake of Menteith 18th October, 1 found dead 15th November (RAB)

RAZORBILL
F 1 Kinneil 6th September, 8 Skinflats 3rd October (DCJ)

FERAL ROCK DOVE
F 200 Grangemouth Docks 29th December (DCJ)

STOCK DOVE
C 11 Cambus 21st March (MVB)

WOODPIGEON
F 1700 (flying E) Bo'ness 18th January (RAS)
SWP 5000 Lecropt 17th January, 2500 on 18th and on 7th February - on broad bean fields (MVB DT)

COLLARED DOVE SWP 16 Dunblane 18th January (MVB)

TURTLE DOVE

F 1 Skinflats 13th July (JSN)

CUCKOO
C 1 Muckhart 4th May (DMB)
SWP 1 Loch Arklet 28th April (RAB). 1 Sheriffmuir 29th April (MVB)

BARN OWL
C 1 Alva 10th May (DMB)

SHORT-EARED OWL
F Kinneil: 2 on 10th January, 3 on 1st and 7th February, 2 on 12th and 15th; 3 on 10th March and 1 on 21st, 1 on 30th December (MVB GJF RAS DT). 1 Loch Elrig 17th October (DCJ)
S In summer present Earls Hill, possibly bred Gargunnock Hills (NCC)

SWIFT
C 20 over Ben Buck 5th July (SFN)
S 1 Stirling 10th May, 1 Bridge of Allan 9th May and 20 on 10th DMB CJH DT)
SWP 16 Dunblane 12th May (MVB)

KINGFISHER
F 1 on River Carron 28th April (RAS). Possibly nested near Stenhousemuir
C 1 Alloa Inch 6th August. 3 Cambus 22nd August. Seen regularly River Devon August - November at Crook of Devon, also at Cauldron Linn in September (RAB DMB WRB SFN)
S 1 at Airthrey Loch 21st January, 10th and 12th February and 2nd March, juvenile on 8th July, 1 on llth, 24th and 29th August, 15th, 17th and 22nd October, 2nd November, 1st December (MVB DMB CJH SFN)
SWP 1 Deanston 24th June. 1 Ashfield 1st October and 4th December (WRB). 1 on River Fillan (Ewich 6km NW Crianlarich) early August (per RAB)

GREEN WOODPECKER
S 2 Carron Valley Reservoir 14th February (DCJ). 1 on 29th November (DLC). Calling at Airthrey from 30th March (MVB)
C Common along Ochil scarp through year, brood of 7 fledged 30th June.
Muckhart Mill 30th April, Crook of Devon 26th November, Glendevon 3rd November (SFN)

GREAT SPOTTED WOODPECKER
C Dollar April, Rumbling Bridge August, Glendevon December (SFN)

SKYLARK
F Kinneil: 16 on 4th January and 50 on 17th, 40 on 30th December. 100 Skinflats on llth January (MVB DCJ)

SWP 150 Thornhill 15th February (MVB)

SANDMARTIN
F 19 nests Lathallan (DCJ)
C 12 Muckhart 18th April, 3 Cambus 22nd April (DMB DCJ)
SWP 1 Dunblane 21st April (MVB). 262 nests Barbush 24th June (DMB)

SWALLOW
F A pure white bird Kinneil 30th July (JSN)
S 1 Airthrey 13th April (DMB)
SWP 1 Lake of Menteith 16th April (DT). 1 at 900m Meall a Churain (Glen Dochart) 25th May (EDC)

HOUSE MARTIN
F 1st Linlithgow Bridge 28th April, last 1st October (DCJ)
S 1 Airthrey 20th April (DMB). 2 Stirling 28th April and 17th October (DT) SWP 2 Dunblane 30th April, 120 on 27th August, last on 14th October (MVB)

TREE PIPIT
F 1 Kinneil 20th April (SJF), 1 on 12th September (DCJ)
SWP 6 Menteith Hills 24th April (DT)

MEADOW PIPIT
F 20 Kinneil 1st January and 50 on 10th (DCJ)

ROCK PIPIT
F 2 Kinneil 17th January (DCJ)

YELLOW WAGTAIL
F 1 Kinneil 3rd September (DCJ)

GREY WAGTAIL
F 2 Kinneil 30th December (DCJ)

PIED WAGTAIL
F Kinneil: 20 on 4th January, 50 on 21st March (DCJ DT). White Wagtail (sub species *Alba): 8* on 20th April and 2 on 27th, 3 on 10th May, 1 on 6th September and 4th October (GJF DCJ)

WAXWING
C 5 Alva 13th January and 2 on 14th (SFN)
SWP 2 Thornhill 11th January (DT)

DIPPER
C Breeding pairs on the River Devon. None below Alva, 3 Alva to Vicars Bridge (16 km), 10 Vicars Bridge to Rumbling Bridge (5 km), 6 Castle Hill Reservoir to Lower Glendevon Reservoir (7 km), 3 Upper Glendevon (4 km) (SFN)

REDSTART

F 1 Skinflats 17th July and 5th September (DCJ)
S 1 juvenile Airthrey 11th August (MVB)
SWP 3 Loch Voil 2nd May (DT). 54 pairs at Trossachs nestbox colony, 279 young fledged, including those from second broods that were more frequent than normal (HR)

WHINCHAT
F Kinneil: 3 on 10th May and 2 on 27th July (DCJ)
C 2 Muckhart 5th May (DMB)
S 4 pairs Gargunnock Hills (NCC). 3 Stirling 24th August (DT)
SWP 2 Loch Arklet 9th May (DT)

WHEATEAR
F Kinneil: 3 on 20th April, 5 on 8th and 10th May, juvenile on 16th July and 2 on 27th, 3 on 8th August, 7 on 13th and 8 on 15th (GJF DCJ)
S 3 Earlsburn Reservoir 12th April (DT)

RING OUZEL SWP 3 males singing Glen Gaoithe 28th April (RAB)

FIELDFARE
S 110 Kippen 4th January, 100 Loch Coulter 21st February, 30 Airthrey on 10th April and 10 on 20th. 30 Kippen Muir 17th October (MVB DT) SWP 50 Lecropt 13th December (DT) (low numbers)

REDWING
S 30 Airthrey 6th April and 10 on 10th. 10 Kippen Muir 17th October (MVB DT)
SWP 20 W Dunblane at dawn on 22nd October (MVB)

BLACKBIRD
S Plumage abnormalities. In Bridge of Allan an aggressive male lost all chest and tail feathers during spring of 1986, regrew in autumn. In 1987 a female lost all head feathers, forehead stayed bare after moult (MT)

GRASSHOPPER WARBLER SWP 1 Lake of Menteith 23rd April (RAB)

SEDGE WARBLER
F 2 Skinflats 7th May. Max 50 at roost Kinneil early August (DCJ)
S 1 Airthrey 1st May (MVB)

WHITETHROAT
F 1 Skinflats 29th April. 2 Kinneil 8th May (GJF DCJ)
S 1 Airthrey 8th May (MVB)

BLACKCAP
S Airthrey: 1 singing 12th May - 8th July, passage 25th July - 2nd

September, 3 on 5th August (MVB)
Male at birdtable Cambuskenneth 18th and 24th December (GTJ)

WOOD WARBLER
C 1 Crook of Devon 23rd April (DMB). 4 Dollar Glen 4th May (RAS) SWP 2 Loch Voil 2nd May, 2 Dunblane from 17th May. 2 males
Drumore Wood deserted after an orienteering event (MVB WRB DT)

CHIFF CHAFF
F 1 Kinneil 2nd and 4th January (RAS DCJ)
C 2 Cambus 1st March (WRB)
S Singing Airthrey 28th April—21st July, passage 24th August-2nd September (MVB) SWP 1 Lake of Menteith 13th April and 2 on 16th (DT)

WILLOW WARBLER
C 1 Muckhart 18th April (DMB), 1 Cambus 22nd April (DCJ)
The Stirling SOC transect survey along the River Devon in early June produced 42 records, about half that of previous surveys in 1977, 79 and 82 which showed very consistent results. The BTO Constant Effort Site scheme showed that 1987 was nationally a poor year with a 24% drop compared with 1986.
S 1 Airthrey 17th April, 1 15th September (MVB)
SWP 2 Dunblane 18th April. 5 there on 12th September (MVB) 2 Lake of Menteith 16th April (DT)

PIED FLYCATCHER
SWP 2 Loch Voil 2nd May (DT). Male Kilmahog and male Glen Lochay 23rd May (WRB). 64 pairs at Trossachs nestbox colony, 402 young fledged (HR)

LONG-TAILED TIT
S 22 Airthrey 2nd July (MVB)

JAY
F At Kinneil Woods through year (RAS)
C 2 Crook of Devon 22nd February

MAGPIE
F 40 Kinneil Woods 2nd January (RAS). 10 Upper Kinneil 10th January (DCJ)
S Pair Earl's Hill 12th April at 330m on grassy moorland with only a small patch of scrubby conifers (DT)

ROOK

S Rookeries: 26 Witches Craig 22nd April; Bridge of Allan N 32, S 89 and 30 Kenilworth Road on 24th April (CJH)

RAVEN
C Regularly on Ochils, food carrying seen. Max 32 Ben Buck 16th May (SFN)
S 9 Dumyat 25th July (MVB)
SWP 25 Stuc Odhar-Ben Ledi 25th January (DT). At least 13 occupied territories, most of which were successful. 8 pairs known to have reared 26 young (PSA)

HOUSE SPARROW
F 100 Upper Kinneil 10th January (DCJ)

TREE SPARROW
F 10 Bo'ness (Champany) 1st January (DCJ). 6 Skinflats 11th January (MVB). 6 Borrowstoun 10th January, 8 Linlithgow 18th January (RAS)
S 2 Craigforth 6th June (WRB)
SWP 30 Carse of Lecropt 18th January (DT)

CHAFFINCH
C 300 Gartmorn 15th February (MVB). 250 by Devon at Dollar 18th November (SFN)
SWP 400 Dunblane 7th February (MVB)

BRAMBLING
F 1 Kinneil 17th January (DCJ)
C 4 Alva 13th January. Female Glendevon 1st December (SFN)
SWP 50 Dunblane 7th February, 1 Kinbuck 23rd October, 1 Loch Watson 15th November (RB WRB MVB)

GREENFINCH
F 40 Kinneil 1st November (DCJ)

GOLDFINCH
C 17 Alva 4th April (SFN)
SWP 20 Lochearnhead 5th November (SES). 40 at 270m Sheriffmuir 5th December (MVB)

SISKIN
C Alva: 10 in gorse 8th January, pair in garden 22nd April (SFN)
S 30 Bridge of Allan 29th December (DMB)
SWP 50 Lochearnhead 5th November (SES)
100 Skinflats llth January (MVB). 60 Kinneil 4th January, 150 on 10th and 900 on 17th (DCJ)

LINNET
F 100 Skinflats 11th January (MVB). 60 Kinneil 4th Janusry,, 150 0n 10th and 900 0n 17th (DCJ)

TWITE

F Kinneil: 35 on 4th January and 100 on 17th, 45 on 1st February and 25 on 7th (DCJ RAS). 80 Skinflats on llth January and 25 on 20th December (MVB)

C 50 Cambus (with Linnets) 21st March (MVB). Male Alva Moss 24th April (NCC). Lower Glendevon Reservoir 2 + 3 by dam, 7 along shore 17th June (CJH)

S 2 Gargunnock Hills 28th April (NCC). Brood of 6 ringed Balglass Corrie 21st June (DCJ). 15 in family parties Spout of Ballochleam 1st September, 2 Loch Coulter 15th November (WRB)

SWP 10 Inverlochlarig 29th June (WRB)

REDPOLL

F 4 Kinneil 2nd January, 15 on 7th February, 20 on 10th March (GLC DCJ)

C 2 pairs in plantation Upper Glendevon Reservoir in May (SFN)

SWP 30 Aberfoyle 25th October, 100 Doune in October (WRB)

CROSSBILL

F 1 Kinneil 30th December feeding on Sea Aster (DCJ)

*S* *4* Airthrey 3rd August (very noisy) (MVB)

SWP 30 Achray Forest 19th October and 90 on 6th December (DT) 4 Glen Dochart (Auchlyne) 27th May, with white wing coverts (WRB)

HAWFINCH

*SWP* 1 Deanston 28th November (WRB)

LAPLAND BUNTING

F 4 Kinneil 10th January. 1 on 17th and 24th (DCJ)

SNOW BUNTING

F 3 Kinneil 17th January (RAS). 6 Skinflats 20th December (MVB)

C *2* Alva 12th January (SFN). 4 Ben Buck 14th April (NCC) (Latest spring date, Editor)

S Glen Gaoithe: 13 Cruinn a Bheinn and 130 Cruachan on 22nd February (RB).
33 at 500m on W. Ochils (Kidlaw) 6th November and 25 on 18th December; 7 Blairdenon 13th November (CJH)

YELLOWHAMMER

F 35 Kinneil 10th January (DCJ). 50 Skinflats llth January (MVB)

C 30 Alva 22nd March (SFN). 150 Gartmorn 15th February (MVB) SWP 50 Lecropt 18th January (DT)

REED BUNTING

F 25 Kinneil 15th February (MVB)

CORN BUNTING

F 2 Skinflats 11th January, 29th April and 17th May (MVB DCJ)

2 Borrowstoun 11th March (RAS)

EDITORIAL NOTES

Sadly, just two months since our Young Forth Naturalist Awards photograph on page 86, David Stephen, that greatly admired Scottish naturalist and writer, died after a short illness. An obituary by James Seaton and an appreciation by James S. Adam appeared in the next day's *Scotsman* (Monday, 23rd January 1989). We understand he had recently gifted his books and paintings to his local library, Cumbernauld, and that some suitable and impressive commemorative project - perhaps a walk across Central Scotland - is being planned.

The theme for our 15th Man and the Landscape, Stirling University, annual symposium on Saturday llth November 1989 is to be 'Man and the Forth'; to include a key survey by Donald McLusky of the University, and a challenging 'Forth into the Future' by Frank Bracewell, Planning Director, Central Region. There will be display/poster presentations made by educational and environmental project groups relevant to the theme.

The third Young Forth Naturalist Awards will be presented at the symposium by Diana Rigg, recently made an Honorary Doctor of the University.

In 1988 Forth Naturalist and Historian initiatives have seen the inauguration of a promising collaborative body, the Central Region Environmental Education Forum (CREEP)

## THE STICKY CATCHFLY *(LYCHNIS VISCARIA* L.) ON ABBEY CRAIG

N. F. Stewart Conservation Association of Botanical Socieities (CABS)

The Sticky Catchfly *(Lychnis viscaria* L.), otherwise known as Red Catchfly, German Catchfly, or Sticky Campion, is a rare plant in Britain, occurring in only a few scattered sites in south and central Scotland, and Wales. The best British population occurs on the south slope of the Ochil Hills between Airthrey and Alva, where there are several thousand plants.

Abbey Craig is situated about a mile to the south-west of the Ochils colony. The Sticky Catchfly was first recorded here by William Forrest (1831), when he reported that it was abundant. Compared to the Ochils colony, I have been able to locate very few records, and its occurrence here seems not to have been widely known. The plant was recorded in 1882 by an anonymous 'gentleman' (Shearer (1888)), and in 1908 D. B. Morris reported that 'it still flourishes'. Recent searches by various botanists failed to locate the plant on Abbey Craig, and it was thought to have disappeared, but in 1983 I located a single plant about 20 cm. across, with one flowering stem. On a second visit in 1987 in the company of Helen Stace, Gene Wilson

and Zoe Ward, the original plant had disappeared, but three smaller non-flowering plants were found a few yards away.

The plants are located near the top of the south-west facing crag, a few hundred metres south of the Wallace Monument, not far from the gully called Wallace's Pass. The plants are/were growing out of a crevice in the rock, which is quartz-dolerite, or on shallow detritus on ledges. Species associated with the Catchfly are Wood Sage *(Teucrium scorodonia),* Wood Brome *(Bmchypodium sylvaticum),* Ivy *(Hedem helix),* Cocksfoot *(Dactylis glomerata),* Polypody *(Polypodium vulgare),* and Rosebay Willowherb *(Chamerion angustifolium).* Other species on the cliff nearby include Sloe *(Prunus spinosa),* Ash *(Fraxinus excelsior),* Bramble *(Rubus fruticosus),* Goosegrass *(Galium aparine).* Wood Meadow-grass *(Poa nemoralis),* and Smooth Meadow-grass *(Poa pmtensis).* Most of these are frequent associates at the sites in the Ochil Hills (Wallis 1975, Bradley 1980).

The continued survival of the plant on Abbey Craig is very precarious. Of particular concern are fires, which occur from time to time along the top of the cliff, and could spread to the scrub on the crag itself. Sticky Catchfly is susceptible to burning, and this may be the reason why the plant is now rare at the site. Rabbits also graze the plants when these are accessible.

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SHEARER (1890) . Tourist Guide to Stirling and Neighbourhood. . . Catchfly is listed on pp 168, 189 and 199 of several undated editions of this guidebook published in Stirling in early 1890s.

The Catchfly photographed on the Ochils below Dumyat flowering in summer

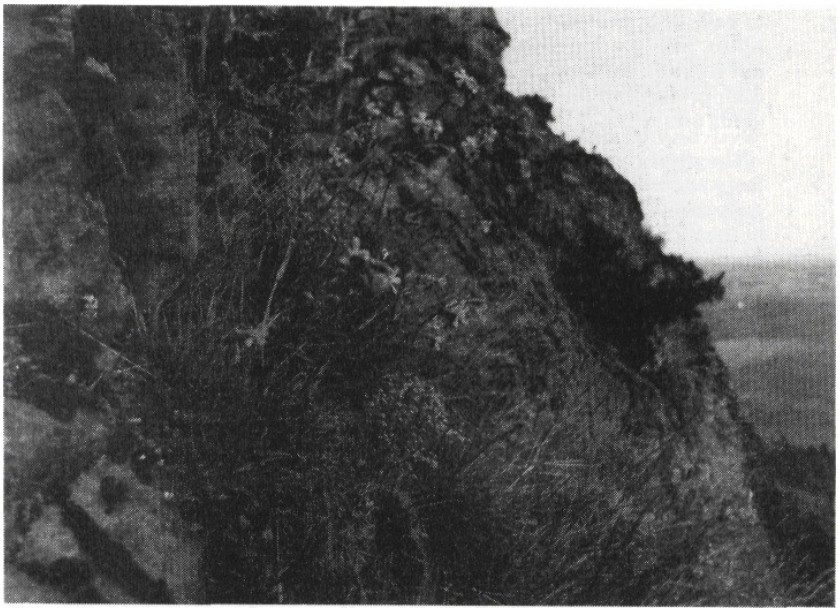
K.J.H. Mackay

**BOOK REVIEW**

**THE SCENERY OF SCOTLAND - THE STRUCTURE BENEATH W. J. BAIRD.**

National Museums of Scotland. 1988. 36pp. £3.75 ISBN 0 948636 15 7.

As Dr Waterston says in his introduction, this little book lets us see landscape in a new way, discover scenery as an expression of the earth's lour dimensions of structure and history. The beauty that stirs us, be it mountain, sea-cliff, strath or carse, is largely the result of geological events involving seas, sediments, rocks, heat, pressure, rain, wind and ii e. The basic text derives from lectures by Bill Baird, who deals with Scotland's complex geology on the lines of Professor George's simplified map and four geographical areas - the Northwest Highlands and Islands, the Northern and Central Highlands between the Moine Thrust and the Highland Boundary Fault, the Central Lowlands south of the Highland boundary Fault, and the Southern Uplands Fault to the English border.



Over 50 illustrative examples enliven this text, with emphasis not surprisingly on the second area given the complexity and variety of its geology. Over 40 of these are spectacular full colour aerial photography by Patricia Macdonald - piloted by her husband. Accompanying each photograph is a short description and account. In addition, there are explanatory diagrams and sketches on almost every page by Michael Spring, some based on originals by Alan Chalmers of the Forestry Commission's Design and Interpretation Branch. Being black and white line, these tend to be overshadowed by the vivid colour photography. The superb quality photographs depict such noted geological sites as ihe Cuillins, Ardnamurchan, The Old Man of Hoy, The Great Glen, The Highland Boundary Fault, Arthur's Seat and Siccar Point.

On the last two pages there is brief mention of conservation and an .uvount of the rock cycle. A comprehensive bibliography lists geological guides and text books covering Scottish geology and scenery in more detail.

This useful and readable reference book for teacher and student alike, graphically illustrates the geological richness bestowed upon Scotland. I would perhaps envisage using a half dozen or so in a smaller class.

Vince Raeburn

**Editorial Note**

The original Baird paper with Chalmers' illustrations is the first one in (his volume II, pp 3-18.

**BOOK REVIEW**

**DISCOVERING FIFE.** Raymond Lamont-Brown. John Donald, Edinburgh. 205pp. 1988. ISBN 0 85976 204 1. £7.50.

This is described as 'a comprehensive guide to the Kingdom of Fife' and indeed so it is –compact and comprehensive. Up to a point.

Geographically it takes in, under various section headings, Dunfermline and West Fife, Kkkcaldy and Industrial South Fife, Falkland and the Howe of Fife, St Andrews and the Eastern Heartland, the East Neuk and its Neighbours, and Fife's Shores of Tay.

Each section is sub-divided again, and using the book as a guide (and Mr Lamont-Brown tells you exactly how to get everywhere) it will be easy to take any district in the Kingdom and tour it, scrupulously if cursorily.

Mr Lamont-Brown's forte is local history of the thumbnail variety. He is compact and comprehensive too on every village, castle, farm, industry and

individual 'big house', and certainly saves a vast amount of hunting through


The Young Forth Naturalist Awards - at the F N & H Stirling University 14th Man and the Landscape Symposium 1988. On the left Shieldhill Primary's winning team with their poster and David Stephen, noted Scottish naturalist, who presented the prizes (now funded by the Bank of Scotland), and Bill Brackenridge, Stirling Ranger and Scottish Wildlife Trust's Biological Recording in Scotland Campaign (BRISC), designer of the competition package The Mighty Oak'. On the right the Alva Primary project team, with Mrs Ashworth their teacher, who had third equal prize. This was the second year of this Award event, aimed to encourage environmental education project work in central Scotland primary schools, and run in collaboration with Ranger Services in the area and Central Region Education.

local leaflets and mini-histories.

But there is more to Fife - there is more to anywhere - than geography, road numbers, dates and thumbnail sketches and histories. Mr Lamont-Brown has evidently no eye for landscape for instance. He barely attempts descriptive prose. The general culture of an area (he translates this into jobs), regional human character (scarcely touched on), language and accents, weather and atmosphere, above all the 'sense of place' that includes all of these and more, tend to go by the board.

He is occasionally anecdotal, occasionally quotes a local poet, but then leaps back into his car and loses himself in a sea of dates, family names and potted histories. This book might well have been subtitled the Fifan Filofax.

Sometimes the intensive research (which I'm sure lies behind the 'quick pace and chunky text' the blurb ominously refers to) does pay off. There is a marvellous summary of the history of that mysterious and easily-forgotten area, Tentsmuir, once the haunt of shipwrecked mariners, vagabonds and outlaws. There is another memorable paragraph, half-melancholy, half - comic, on the derelict farm cottages (and thek privies) in the East Neuk.

Had the whole book matched these and a few other vivid passages, I should have been reviewing a masterpiece and not the useful, sketchy little vade mecum that makes up most of the text.

There are good and frequent photographs. But the publishers must learn that repeated invitations to 'see page 00' are not helpful.

David Angus

**BOOK REVIEW**

DISCOVERING EAST LOTHIAN. Ian and Kathleen Whyte John Donald, Edinburgh. 233pp. 1988. £7.50. ISBN 0 85976 222 X

This is the sixth title in the series. Its predecessor on West Lothian was favourably reviewed in these pages (volume 9: 64). The publishers say 'Like the other titles in the series, this is a complete, practical guide to the area . . . The authors are a husband and wife team of historical geographers who know and love East Lothian well'. The claim to completeness is barely justified. The natural history of the area, for instance, is confined to a three page account of the birds to be found on the coast and offshore islands and this is not wholly reliable (Cormorants do not breed on the Bass Rock). But such deficiencies are irrelevant if one accepts the book for what it really is - an account of the area through the eyes of historical geographers. East Lothian, with its long history of civilised settlement, makes an ideal subject for such a study. The authors do indeed know and love their subject well. They also have the capacity for communicating that knowledge, and the

subject is one that enormously enhances one's appreciation of the environment that might otherwise be taken for granted.

The ten chapters deal successively with the geological influence on the landscape; the religious buildings from primitive to modern times; the castles and other defensive buildings; the battlefields during the 16th and 17th centuries when East Lothian was the 'cockpit' of Anglo-Scottish contention; the many houses of historical interest with which the county is so richly endowed; its villages and towns; its industrial activities, spanning the whole range from estate mills to coal mines; and communications, taking in roads, railways and harbours.

If the publishers can find writers of this quality for the other books in this series, they may feel justly proud. They have less reason for pride in their proof-reading. Seldom have I read a book with so many misprints. 'Pope Plus II' is the happiest of these (p 36). Perhaps it was the intention of reducing his golf handicap even further that he visited East Lothian in 1435 and was left with rheumatism for the rest of his life! I have one further mild complaint. It is a strong point that most of the photographs are well chosen and appear at the appropriate place in the text. This makes it all the more noticeable that some are irrelevant (for example the two of horse racing at Musselburgh at pp 172 and 173) while others are misplaced. But in general the production is very attractive and the book can be most enthusiastically recommended.

Dougal G. Andrew

## PEOPLE OF THE FORTH (3)

## DAVID BRUCE - THE EARLY NATURALIST YEARS

J. Mitchell

Nature Conservancy Council

### INTRODUCTION

Major General Sir David Bruce KCB FRS (1855-1931) holds a unique place among Stirling's adopted sons, most notably for pioneer work in the field of modern parasitology. Rigorously applying his training and practical experience in both zoology and medicine, the part played by Bruce in tracing the animal vectors of Malta Fever and other serious diseases have been described as among the most unequivocal successes of preventive medicine. David Brace's distinguished professional career together with the many military, civil and academic honours conferred on him is well documented, but, perhaps understandably, far less attention has been paid to his formative years. The present account attempts to cover this

earlier period in Brace's life, in particular to assess his personal contribution as an amateur naturalist to our knowledge of Scotland's avifauna during the latter half of the 19th century.

## AUSTRALIA - AND THE BRUCE FAMILY'S RETURN TO SCOTLAND

David Bruce was born in Melbourne, Australia, on 29th May 1855. Hailing from Stirling and Airth respectively, his mother and father (David Bruce Snr) had emigrated from Scotland shortly after the discovery of gold in the State of Victoria in the early 1850s. Bruce Snr was no ordinary prospector chancing his luck however, for as an engineer he saw the opportunity of guaranteed profitability in the setting-up of an ore crashing mill at the Bendigo gold fields. After 'realising a competence' in a comparitively short space of time, Bruce Snr brought his family back from Australia in 1860 or '61. On their return to Scotland the Braces settled in Stirling, building a new house at No. 1 Victoria Square. Master David - now five years old - was enrolled at Stirling High School, where he remained to the age of fourteen. Little is known of his developing naturalist leanings during his Stirling school days, except to say that he shared his father's interest in ornithology (Bruce Snr was later to become a founder member of the Stirling Field Club) and spent a great deal of time nest-hunting in the surrounding countryside.

## APPRENTICESHIP IN MANCHESTER

On leaving school in 1869 Bruce was placed with J. & N. Philips & Co., a firm of merchants, manufacturers and general warehousemen in Manchester. The world of commerce in an industrial city appears to have held little appeal to the active young man however, for all his free moments were devoted to athletic pursuits. Indeed in later life Bruce (who was noted for his commanding physique) confessed to have nurtured a secret ambition during his mid-teens to become a professional boxer or footballer. After working in Manchester for three years, Bruce's intended career in business came to an abrupt end when he was brought back to Stirling to convalesce following a particularly severe bout of pneumonia.

## ENTRY TO EDINBURGH UNIVERSITY AND A CHANGE OF VOCATION

Two years or so passed and Bruce, now at the age of twenty, entered the University of Edinburgh to read zoology. At the end of his first year he had gained the class medal in natural history, but at this point was persuaded by a friend to switch to medicine, being awarded Batchelor of Medicine and Master of Surgery degrees by the University in 1881. After graduation he left Scotland for a brief period of general practice in southern England. Bruce was soon on the move again however, taking a commission as Surgeon-Captain in the Army Medical Service in 1883, a posting to Malta the

following year, and his first positive steps into the pages of medical research almost immediately afterwards. In his subsequent undertakings in Zululand and later at the 118 day siege of Ladysmith during the South African war, Bruce was to show the sort of mettle in the face of adversity that adventure stories in boys' papers were once modelled on.

## INTEREST IN ORNITHOLOGY RE-KINDLED

But to return to Bruce's recuperation period at Stirling after his illness in the winter of 1872/73. It was at this time as his health and vigour was gradually restored that he fell under the influence of J. A. Harvie-Brown, Laird of Dunipace and leading Scottish ornithologist of his day, when the collecting of rare bird skins and eggs for 'scientific' purposes was at its height. Fired by the colourful exploits of the more daring collectors as recounted by Harvie-Brown, Bruce was even to emulate one of the arch-robbers of Osprey nests - Lewis Dunbar - by swimming the icy-cold waters of Loch an Eilein in Speyside to examine the famous Osprey nest on top of the castle ruins.

For the Victorian ornithologist/collector, two of the most coveted prizes waiting to be claimed in the opening years of the 1870s were the finding of the first Dotterel and Snow Bunting nests and eggs in the Scottish highlands. The first of these gaps in the trophy cabinet was filled on 16th June 1873, when Harvie-Brown and his regular collecting companion Captain H. W. Fielden took a clutch of Dotterel eggs from the high hills above Drumochter Pass. The race to bag the first Dotterel's nest and eggs in Scotland having been won, Bruce (still in his late teens and keen to beat the old guard at their own game) set his cap at the Snow Bunting, making the first of seven expeditions to the Grampian highlands in the late-spring/early summer of the following year. The inclusion of the yet to be tracked-down Snow Bunting in part 9 of Professor Newton's revised Yarrell's *History of British Birds,* which was published in early 1876, effectively re-threw the gauntlet. Bruce, now well and truly smitten by Harvie-Brown's annual bout of spring-fever for 'getting away to the north', picked it up with even more determination.

## THE GRAMPIAN EXPEDITIONS

It is only Bruce's third and final attempts to be the first to discover a Snow Bunting's nest in the highlands for which information is available. Both these expeditions to the Grampians in 1876 and 1880 respectively can be pieced together from articles written by Bruce for *MacMillan's Magazine* and *Good Words,* supplemented by two or three letters in the Harvie-Brown correspondence housed at the Royal Scottish Museum and the Kelvingrove Art Gallery and Museum, also dated and localised specimens in the British Museum (Natural History), and close study of the Ordnance Survey map

of the Cairngorms area.

On the first of these trips north for which some details are known, Bruce left Stirling for Braemar on 20th May 1876. Establishing his base at a local inn, he spent the next seven days exploring the high corries of Ben Macdui, Braeriach, Cairn Toul and Lochnagar, where summering Snow Buntings had been reported by visiting naturalists in the past. Bruce was joined at Braemar by Harvie-Brown and H. E. Dresser (who was working on his nine volume *History of the Birds of Europe* at the time) for a few days from the 23rd, but persistent bad weather and poor visibility on the high ground thwarted any chance of a combined operation. Finding himself becoming discouraged at his failure to find any trace of Snow Buntings, Bruce wisely decided to temporarily break-off the chase and turn to that other 'blue-riband' upland bird - the Dotterel.

On 29th May and accompanied by the Glen Callater gamekeeper, Bruce headed south for the rounded-summits of the Caenlochan plateau. After many hours of 'sweep' searching suitable ground, a Dotterel and its much sought after nest and eggs fell to their grasp on the north-west side of Glas Maol. Even the seasoned 'keeper was taken with the moment of the occasion, alternatively congratulating Bruce in English and himself in Gaelic. Of his long walk back to the inn at Braemar, Bruce wrote -

> 'it was a wild and stormy night, the hurrying moon showing at intervals through ragged rifts in the driving clouds; but little recked (heeded) I, for had not the Dotterel's nest been found and taken'.

It was also his twenty-first birthday and success never tasted so sweet.

His spirit lifted by this change in fortune, Bruce immediately focussed his attention again on the pursuit of Snow Buntings, revisiting a particularly promising stony conic below the southern shoulder of Braeriach. On 1st June and literally within the last few hours of his '76 'campaign', two pairs of Snow Buntings were found in this desolate spot he was later to name 'Barren Hollow'. With virtually no time left for nest hunting before heading back to Braemar and home, Bruce procured one of the males with the innocent-looking walking-stick gun he always carried. Little would Bruce have thought at the time that eighty-five years later, when Desmond Nethersole-Thompson was preparing the taxonomic section of his monograph on the Snow Bunting, this single preserved specimen was to be the sole piece of surviving evidence as to which race of Snow Buntings inhabited the Cairngorms following a period of exceptionally severe Arctic winters in the mid-19th century.

The second of Bruce's visits to the Cairngorms on record took place in June 1880, during his last full year at university and residence in Scotland.

After a long, fatiguing trudge up from Aviemore station and through the Lairig Ghru, Bruce made his base camp in the original Corrour Bothy near the headwaters of the River Dee and within ready strike of the 'Barren Hollow'. Appalling weather set in, but by day three he had located a female and three male Snow Buntings - no easy task without the aid of binoculars which today we take for granted. Despite a further week of patient watching and careful searching that first nest waiting to be discovered in the highlands proved as elusive as ever, and Bruce reluctantly turned his back on the summer haunts of the Snow Bunting in Scotland for the last time.

## BRUCE'S PLACE IN THE ANNALS OF SCOTTISH ORNITHOLOGY

To the natural historian Bruce's two published articles describing his exploration of the Grampian highlands are still worth studying for their wealth of original observations on Scotland's montane birds. Apart from his notes on Snow Buntings in their breeding habitat and the first authenticated nest of Dotterel to have been found in the Cairngorms massif, Bruce's writings include one of the earliest descriptions of tree-nesting by Golden Eagles and what was possibly the highest nesting pair of Peregrines ever to be recorded in the British Isles. Although it is true that he never succeeded in his principal objective, the dedication and endurance shown - often under the most severe conditions -during the seven year quest for the Snow Bunting in Scotland, were to be the key to David Bruce's achievements in the challenging years ahead.

## ACKNOWLEDGEMENTS

I would like to thank the following people who have shared my interest in David Bruce and have helped in various ways to make the story of his early life more complete: G.A. Dixon (Central Region Archivist), Dr J. A. Gibson (Scottish Natural History Library), R. McCutcheon (local historian, Stirling), M. P. Walters (British Museum, Natural History), Dr A. Watson (Institute of Terrestrial Ecology), T. Weir (Scottish Mountaineering Club), and the library services of the City of Manchester, University of Edinburgh, Royal Scottish Museum and the Nature Conservancy Council.

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## UNIVERSITY OF STIRLING SCOTTISH SUMMER SCHOOLS

### June - August 1989

Stirling University's Summer Schools Programme for 1989 has been given a new look. Many of the successes of the previous Heritage School have been incorporated into a wide range of courses and workshops which will appeal not only to specialists in 'Master' classes, but also to those of all ages and all levels of ability in the rich cultural heritage of the arts and crafts of Scotland

| Summer School | | |
|---|---|---|
| Stained Glass Workshop | 17-18 June | Weekend |
| Cauld Wind Pipes | 17-18 June | Weekend |
| Scottish Wildlife and Conservation | 17 June | One Week |
| Introduction to Photography | 19 June | One Week |
| Scottish Art 1800-1930 | 19 June | One Week |
| Wildlife of the Scottish Mountains | 24-25 June | Two Days |

| | | |
|---|---|---|
| Italic Handwriting | 24 June | One Week |
| Handloom Weaving | 24 June | One Week |
| West Coast Safari | 26 June | One Week |
| Silk Spinning | 26 June | One Week |
| Roman Scotland | 30 June | |
| | 1-2 July | Weekend |
| Calligraphy | 1 July | One Week |
| Scots Fiddle | 2 July | One Week |
| Scots Fiddle | 9 July | One Week |
| Accordion | 9 July | One Week |
| Clarsach | 10 July | One Week |
| Bagpipe | 15 July | One Week |
| Drum Workshop | 21-23 July | Weekend |
| Contemporary Dance Workshop | 22 July | One Week |
| Scots Theatre | 24 July | One Week |
| Classical String Ensemble Workshop | 29 July | One Week |
| Scottish 'Line & Light' Drawing & Painting Workshop | 29 July | One Week |
| Machine Knitting - Creativity & Design | 31 July | One Week |
| Highland Dancing | 5 August | One Week |
| Tracing Your Ancestors | 7 August | One Week |
| Scottish Traditional Dancing | 12 August | One Week |
| Introduction to photography | 14 August | One Week |
| Classical Guitar Workshop | 14-17 August | Four days |

For further details of any of these courses contact:
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## BURNS AT HARVIESTOUN

David Angus

Leaving Tillicoultry on the road to Dollar, you soon come on the left to a lodge entrance, and a monumental cairn (Figure 1). Walk up the drive a little way and among the rhododendron bushes on your right, with lofty fir trees crowding about, is a great pile of weedy rubble. It is all that remains of Harviestoun Castle.

But that was not the castle Robert Burns knew, merely its successor. The setting, however, the parks stretching south to the 'clear winding Devon', the brawling burn, the firs, the flourishing estate and the heights to the north

'Where braving angry winter's storms The lofty Ochils rise' -

all these are still pretty much as the poet knew them from two visits paid in 1787. His memories of the place, in the nine years of life left to him, must

have mingled some of the sweetest and most bitter of all that 'variorum' he called life.

Gavin Hamilton, the young lawyer of Mauchline who was one of Burns's dearest friends and closest allies, was the link between Burns and Harviestoun. Gavin's stepmother had been asked by the proprietor of Harviestoun (the widower John Tait) to preside over his household until his daughter grew up, and Mrs Hamilton had taken her own grown-up children (including Gavin's attractive step-sister Charlotte) to live with her at her new home.

But Harviestoun had another significance for Burns. It was also the home of the charming, hazel-eyed Margaret (Peggy) Chalmers, Gavin's cousin, who normally stayed there with her mother as part of the Hamilton menage. Burns may have known (loved?) Peggy in Ayrshire in earlier times, but certainly he had met her in Edinburgh on social occasions at the home of the blind poet, Dr Blacklock, where Peggy's fine singing voice and accomplished piano-playing helped make her a great favourite.

Burns, indeed, became one of Peggy's warmest admirers - she had many, as he soon found - and though he was not to see her on his first visit to Harviestoun (August 27), it is clear that at this time, at the start of his first Highland Tour, he was eager to see the natural and domestic setting which normally housed this particular jewel of womankind.

Burns's first visit to Harviestoun was a one-day affair only. He rode there from Stirling along the Hillfoots, arriving for breakfast (in those days a social repast) at 10 am. In the afternoon he joined a party on horseback (including Charlotte Hamilton) who rode to inspect the precipitous Cauldron Linn in the Devon and the original Rumbling Bridge and the Deil's Mill, further up the river.

In the evening Burns rode back to Stirling, to sup with Dr David Doig, headmaster of the High School, Christopher Bell of the English School in Baxter's Wynd (Baker Street) and Lieutenant Gabriel Forrester of the Castle garrison.

Despite Peggy Chalmers' absence in Edinburgh, Burns described these hours at Harviestoun as among the happiest of his whole life, and sent an ecstatic account of them (and of Charlotte in particular) to Gavin Hamilton next morning from Wingate's (Golden Lion) Hotel.

In October, however, Burns did see Peggy at Harviestoun, and not just for one day. And in October romance was in the air. Burns had a companion there with him on this second visit, young Dr James Adair, and two years later Adair was to marry Charlotte Hamilton as a result. When

Burns himself saw Peggy Chalmers there (on the first visit in foul weather), it was as if he had seen her and loved her for the first time.

He expressed this in a song he wrote for her, and about her, in November, back in Edinburgh -

Where, braving angry winter's storms,
The lofty Ochils rise,
Far in their shade my Peggy's charms,
First blest my wondering eyes;
As one who by some savage stream,
A lonely gem surveys,
Astonish'd doubly, marks its beam,
With art's most polished blaze.

Blest be the wild, sequester'd glade,
And blest the day and hour,
Where Peggy's charms I first survey'd,
When first I felt their pow'r!
The tyrant Death, with grim control,
May seize my fleeting breath,
But tearing Peggy from my soul
Must be a stronger death.

There are clear echoes here of Burns's sojourn at Harviestoun as part of his second Highland tour. Certainly it was on a stormy October day (foreshadowing winter) that he met Peggy first at the Castle. Certainly he was shortly to see her by the Cauldron Linn and by the Deil's Mill at Rumbling Bridge in 'a wild sequester'd glade' and by a 'savage stream', for the gentle Devon does wax savage (among trees) at these points.

The last four lines, however, make this a far from happy or exultant love poem. It is, indeed, a sombre, even tragic piece, intended by Burns to be sung to that most heartbroken and heartbreaking of melodies 'Niel Gow's Lament for Abercairny'. Jean Redpath, aiding the writer with a lecture at Stirling University's Heritage of Scotland summer school, sang it for an audience at Airthrey Castle, and brought three major talents into memorable unison.

Why such a tragic song? It is possible to hazard a guess.

One would have expected that, with 'the time, the place and the loved one' all at last cohering or coinciding, Burns would have been delighted to stay on at Harviestoun as long as possible once he'd got there -especially as the weather effectively prevented his travelling further for any distance.

Instead, he only put up at Harviestoun (to begin with) for one single night. He spent the next nearby, at Alva, where he went out of his way to

spend some time with an old Ayrshire friend, Betty Black, now married and running a public house there.

Then, bad weather or no, he pressed on to Ochtertyre House in Strathearn, to which he had been invited by Sir William Murray. In the Riddell MS (evidently trying to impress the people at Friar's Carse) he exaggerated the length of time spent there, but he did linger. Returning south, he again went out of his way to visit the other Ochtertyre, in Menteith, to which he had been invited by the proprietor John Ramsay (an Edinburgh friend he had met in Stirling in August). In short, Burns seemed to rush to get away and might be thought to have dallied on his return journey.

Not only that. Someone who drank with Burns at Lucky Stewart's (Betty Black's) on his visit to Alva bore witness to the fact that the poet was unduly silent and abstracted that night. Indeed, putting it bluntly, he had nothing to say for himself. This was quite untypical of Burns, and yet seems of a piece with the behaviour just mentioned. So again - why?

It seems obvious. We know from Peggy Chalmers herself (for she told the poet Thomas Campbell later) that Burns did propose to her at one point, and that she rejected him. My own guess is that the proposal and the rejection came at Harviestoun, that first night he spent there with Peggy in early October. It would certainly explain his silence and moodiness at Alva, twenty-four hours later, his urgency in getting away, his reluctance to return.

At last, however, he did come back to Harviestoun. Adair had stayed on there during his absence and fallen in love with Charlotte Hamilton. Burns was not the type of man to cast a shadow over his friend's happiness. He must have observed (wryly?) the evident attraction between the smitten pair; and in any case Peggy seems to have treated him on his return as she had always done. The stay at Harviestoun that followed for Burns seems to have been a happy and sociable one.

The reunited party spent a few days sightseeing. They saw various beauty spots and picturesque places, including Castle Campbell, Glendevon Castle, and (again) the Cauldron Linn, the Rumbling Brig and the Deil's Mill.

All of these survive, of course, so we may follow in Burns's footsteps if we so wish. The spectacular ruin of Castle Campbell is open to the public; at Glendevon Castle (or what is left of it) we may drink a mournful toast to Peggy Chalmers in the Dungeon Bar; the Cauldron Linn is difficult, but not impossible of access; the old parapet-less Brig has a later bridge thrown over it, across which the modern traffic flows, largely unaware of the spectacular chasm underneath; and the Mill (with the Devon rushing

between rocks making a hollow, clacking sound, on Sundays as well as on week-days - hence the name) can be observed (like the old Brig) from modern walkways - replacing those that Burns's party knew - in the grounds of what was until recently Rumbling Bridge Hotel, and is now a nursing home.

Robert Burns, of course, never really fell out of love with anyone he *had* loved in his entire life. Not consciously anyway. Even in January 1788, writing to his new love Clarinda (Mrs Agnes Maclehose) he confessed to her that Peggy was 'still registered in my heart's core'. And he was hurt to find her - this was back in Edinburgh - now 'surrounded by the blandishments of flattery and courtship'.

As we shall see, Peggy Chalmers was still registered in his heart's core - the last to survive there it seems - on his deathbed at Dumfries in 1796.

So that, even after her rejection of him, and although he recognised there was no practical future for him with Peggy, Burns's feelings for her could instantly be re-ignited if he saw her or even thought of her. For nearly a year after they parted (for the last time) at Harviestoun, Burns and Peggy Chalmers corresponded; and we may be sure that for all that time, love continued, on his side, unabated.

Peggy Chalmers evidently failed to understand this, which is why she was so upset over the two love-songs (we have quoted one) he wrote her in November and December 1787. These were as ardent as you would expect from Burns. Indeed so much so that Peggy tried to dissuade him from publishing them, and one of them ('My Peggy's Charms') did remain unpublished until after Burns's death -

My Peggy's face, my Peggy's form,
The frost of hermit Age might warm;
My Peggy's worth, my Peggy's mind,
Might charm the first of human kind;

I love my Peggy's angel air,
Her face so truly, heavenly fair,
Her native grace so void of art,
But I adore my Peggy's heart.

The lily's hue, the rose's dye,
The kindling lustre of an eye;
Who but owns their magic sway!
Who but knows they all decay!

The tender thrill, the pitying tear,
The generous purpose, nobly dear,
The gentle look, that rage disarms -
These are all immortal charms.

Interesting, and revealing, to compare this expression of naked passion and heartfelt longing with the merely elegant and graceful poetic tributes which he paid to Charlotte Hamilton at this time. Even after an outright rejection, Burns's feelings for Peggy were dormant, never dead. They could also be revived by letter-writing, as in the fit of loneliness and depression he felt at Ellisland in September 1788, when he had finally to face the fact that it was all over, and struggle (at long last, and in vain) to tear Peggy from his soul.

By this time Burns himself was married to Jean Armour, and Peggy Chalmers was about to marry the wealthy banker Lewis Hay. Prevented from harvesting by bad weather - the season and climatic conditions must have borne him back, relentlessly, to that fateful October night -Burns took shelter in the smokey hovel at The Isle which he then occupied alone (waiting for the present farmhouse to be completed and Jean to arrive), and wrote his last-ever letter to Peggy. He knew the relationship and the correspondence were at an end, and for once Burns gave way to self-pity. Sadly he compared Peggy with his new wife: on the one hand the intelligent, sophisticated belle of Harviestoun Castle and the Edinburgh drawing-rooms; on the other, the homely, if comely and compliant lass he had married out of duty — or so he said.

We may be sure also that he could not help mentally comparing his present forlorn situation - part-time farmer, part-time Exciseman (an occupation he knew Peggy despised) and spare-time poet - with those days of a year before when he was, in his own words, 'the wonder of all the gay world', the romantic young ploughman-poet, conquering hearts everywhere as he moved triumphantly through Scotland from castle to castle like an uncrowned king, gathering her old folk-culture about him so that he might revivify and repopularise it, and producing his own masterpieces at will (or so it seemed).

Peggy Chalmers somehow symbolises that great period in his life -the time of his own fleeting and illusory freedom, independence and supremacy. Old Catherine Bruce at Clackmannan Tower had 'knighted' him with the Bruce's own sword, but on their parting had commanded he kiss, not her hand but her mouth - not like subject, but like King.

Peggy it was who could have been his true Queen. She was, perhaps, the only one of his many loves whom he regarded as his intellectual equal. Her literary and musical tastes were his. An Ayrshire lass, she had conquered social Edinburgh. Perhaps if she *had* become his queen, that marvellous time would have gone on. The humble drudgery of farming and excise-work, the bringing up of a family on a pittance, the social obloquy that came at Dumfries, the death in the shadow of a debtors' prison - that and much else need never have been. At Alva that October night he might well have written — And forward though I canna see, I guess, and fear.

Now, choking in the reek of The Isle, he wiped his eyes and wrote to her - and it was Harviestoun in October he was remembering -

'When I think I have met with you, and have lived more of real life with you in eight days than I can do with almost anybody I meet with in eight years - when I think on the improbability of meeting you in this world again - I could sit down and cry like a child.' A stronger death, indeed.

Oddly enough, neither Charlotte Hamilton's nor Peggy Chalmers's marriage came to much. James Adair died after only thirteen years of marriage. His family disliked Charlotte, finding her an oddity, and after his death were agreed it had not been a happy union. (Adair himself, writing in 1798, claimed however he had found in it much happiness). Lewis Hay also died young and Peggy, as his widow, spent the rest of her long life in Switzerland, dying there in her eighties.

Why did Peggy turn Burns down? Evidently she had heard gossip about his erratic life-style in Edinburgh and felt that sexually she could really have nothing to do with a man who had fathered at least one child there on a prostitute.

Socially he was acceptable and could be her intimate friend. Maritally he was not, and whatever she may have felt about the poet personally - and at Harviestoun they would appear to have been as close as could be on a platonic level - she was cold and clear-eyed about that particular fact of life.

Burns, throwing himself headlong into an affair with the unhappily married Clarinda, then settling for marriage himself with Jean Armour of Mauchline, must have faced up to it too. (We see him beginning to, in that letter). He was to have other lovers beside these. But at the end, as he lay on his deathbed in Dumfries, it was the memory of Peggy that surfaced last of all, and wrote itself into what was to prove his swan song.

As he lay in the Mill Vennel waiting for Tyrant Death' to seize his 'fleeting breath', he reached, it seems, into the innermost recesses of his soul to defy - or at least to question - that 'strange death' he had already died. The song is entitled 'Fairest Maid on Devon Banks' -

Full well thou know'st I love thee dear,
Could'st thou to malice lend an ear! O did
not Love exclaim - 'Forbear, Nor use a
faithful lover so!'

Fairest maid on Devon banks,
Crystal Devon, winding Devon, Wilt
thou lay that frown aside
And smile as thou wert wont to do?

Then come, thou fairest of the fair, Those
wonted smiles, Oh, let me share! And by that
beauteous self I swear No love but thine my
heart shall know!

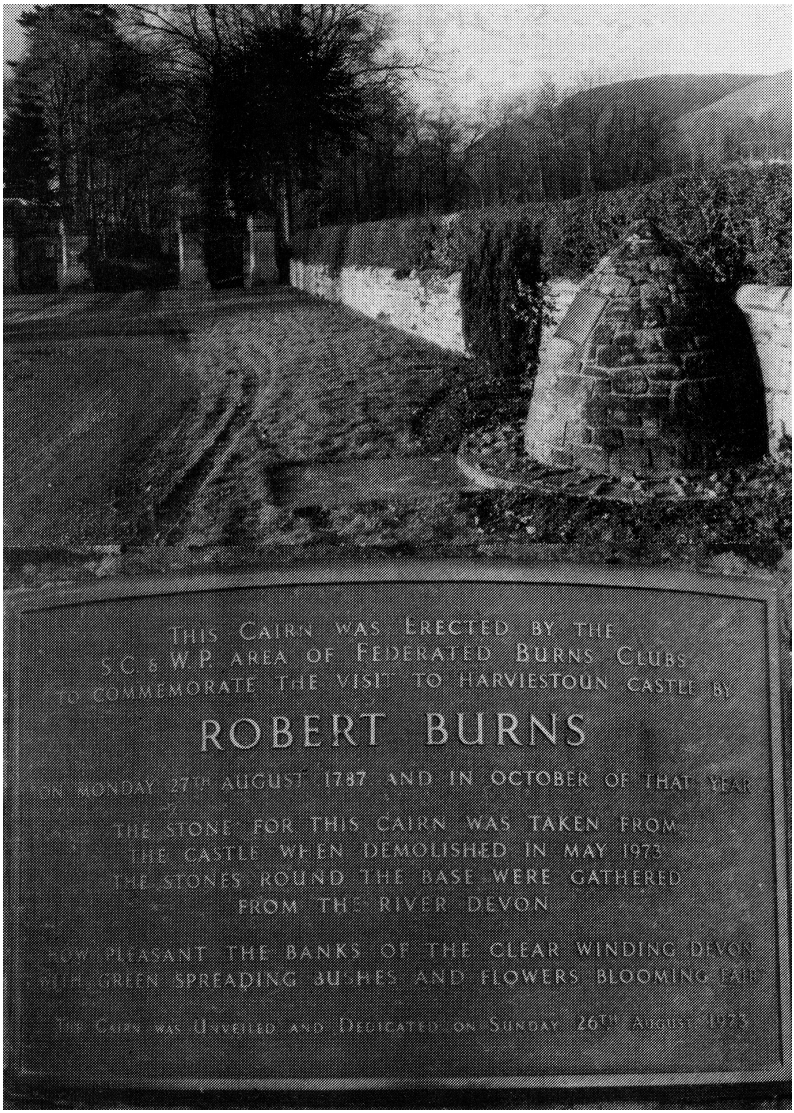
Fairest maid on Devon banks,
Crystal Devon, winding Devon, Wilt
thou lay that frown aside
And smile as thou wert wont to do?

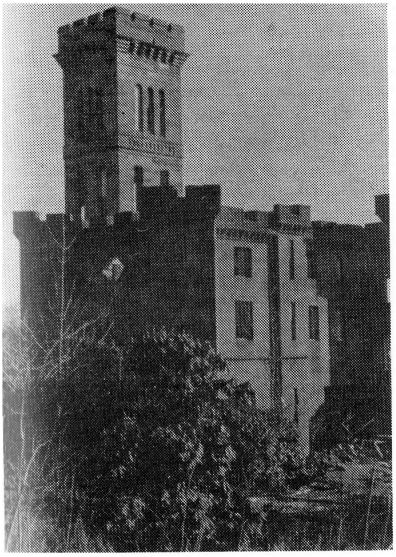
But the Burns who wrote that was at death's door, and knew it. He wrote to her more realistically about the true Burns when, in a letter sent to her years before, he described himself as 'the sport, the miserable victim of rebellious pride, hypochondriac imagination, agonizing sensibility and bedlam passions'. And again, when he told her 'There are just two creatures I would envy - a horse in his native state traversing the forests of Asia, or an oyster on some of the desart (sic) shores of Europe.' Why? 'The one has not a wish without enjoyment, the other has neither wish nor fear.'

It may have been more than the voice of malice to which Peggy Chalmers listened at Harviestoun. It may well have been the voice of reason. In Rab the Ranter for a husband she would have had a moody, tempestuous tiger by the tail, and his own wistful dream of becoming a tame, faithful, polite gentleman-poet may well have been nothing more than that.

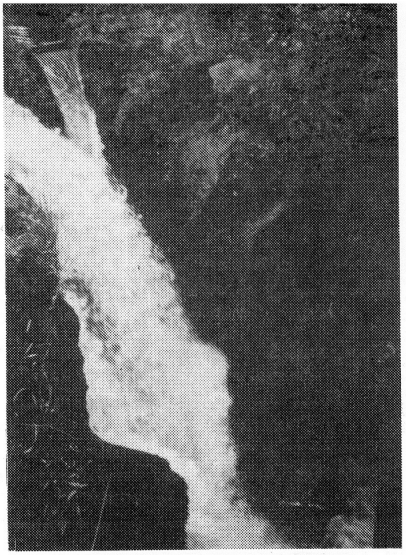
But passion such as Burns harboured for Peggy may be stronger than anything. There were times when he thought so. She never did. As for us - we shall never know.

In no small measure thanks to the lobbying of the late Alex MacIver of Dollar Burns Club this commemorative cairn stands at the East Lodge entrance to Harviestoun on the Tillicoultry-Dollar road -


THIS CAIRN WAS ERECTED BY THE
S.C. & W.P. AREA OF FEDERATED BURNS CLUBS
TO COMMEMORATE THE VISIT TO HARVIESTOUN CASTLE BY
ROBERT BURNS
ON MONDAY 27TH AUGUST 1787 AND IN OCTOBER OF THAT YEAR
THE STONE FOR THIS CAIRN WAS TAKEN FROM
THE CASTLE WHEN DEMOLISHED IN MAY 1973
THE STONES ROUND THE BASE WERE GATHERED
FROM THE RIVER DEVON
HOW PLEASANT THE BANKS OF THE CLEAR WINDING DEVON
WITH GREEN SPREADING BUSHES AND FLOWERS BLOOMING FAIR
THE CAIRN WAS UNVEILED AND DEDICATED ON SUNDAY 26TH AUGUST 1973



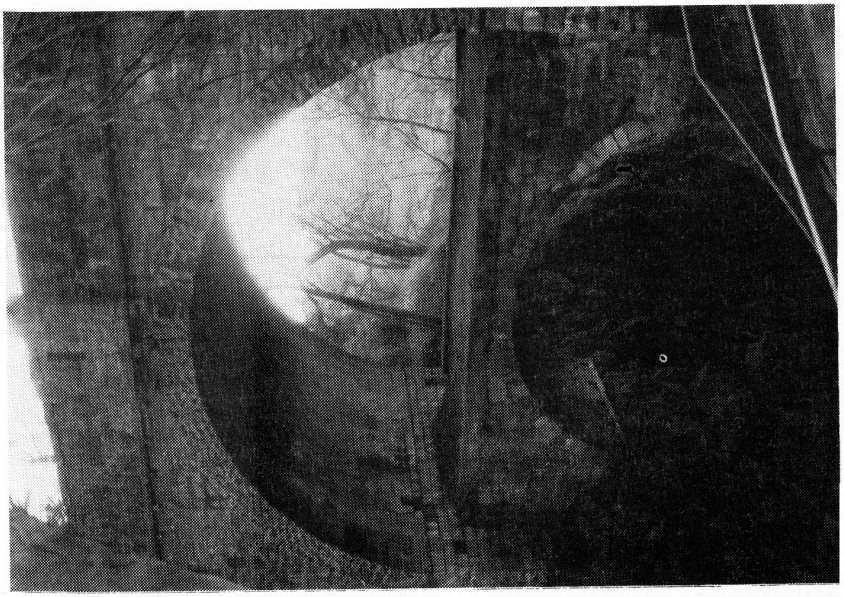
Harvieston Castle



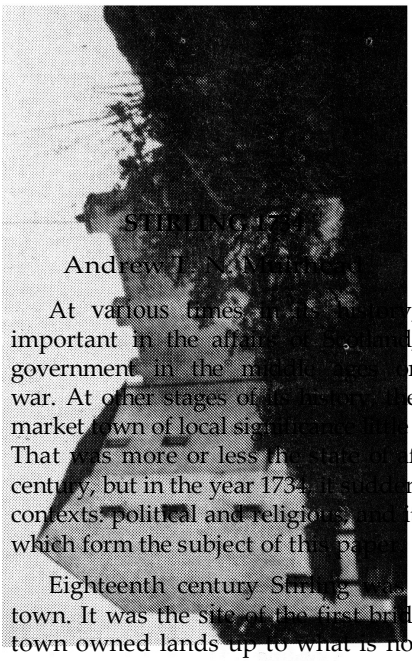
Cauldron Linn-upper

Devil's Mill

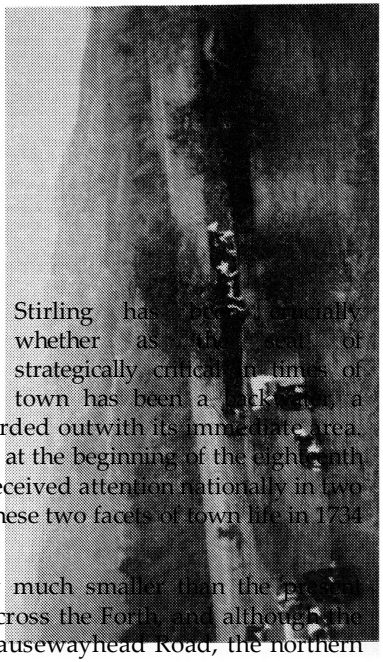
Cauldron Linn-lower



Rumbling Bridge



Glendevon Castle



The Devon

## STIRLING 1734

### Andrew [illegible]

At various times in its history, Stirling has been crucially important in the affairs of Scotland, whether as the seat of government in the middle ages or strategically critical in times of war. At other stages of its history the town has been a backwater, a market town of local significance only regarded outwith its immediate area. That was more or less the state of affairs at the beginning of the eighteenth century, but in the year 1734 it suddenly received attention nationally in two contexts, political and religious, and it is these two facets of town life in 1734 which form the subject of this paper.

Eighteenth century Stirling was very much smaller than the present town. It was the site of the first bridge across the Forth and although the town owned lands up to what is now Causewayhead Road, the northern

limit of the town was at the bridge. To the south and west the boundary was the wall, much of which still exists. The lower area of the town, where the Thistle Centre now stands was marshy and little used. The greater part of the population lived in the 'Top of the Town' mainly in tenements of varying ages and states of repair. The town must have looked much as it had 150 years earlier.

There had been new building in the meantime of course. In 1734, one of the newest buildings was a house in St. Mary's Wynd built for one of the more prosperous citizens. That house is now the Settle Inn. Right in the centre of the burgh stood the new Tolbooth which had been completed only in 1705 to replace its predecessor which had had to be demolished as being no longer safe.

Much of what we now think of as Stirling lay beyond the jurisdiction of the town. Areas like Riverside, Braehead, Newhouse, Raploch, all formed part of St. Ninian's Parish and were largely rural. Uphill from the burgh, the Castle and most of Castlehill were part of the parish of Stirling for church affairs, but owned no civil allegiance to the town council.

As a royal burgh, Stirling had certain jealously guarded privileges. Some of these were commercial, such as the right to hold markets and to charge customs dues on goods brought in to be sold. The Customs Port Bar is so called since it stands on or near the site where the customs were collected from the unlucky inhabitants of St. Ninians, who had long coveted a market of their own. Against the privileges have to be counted obligations. The inhabitants had to have their corn ground at the burgh mill and the charges for grinding, the 'mulcture', was a useful source of income both to the town miller and the town council, who employed a 'Collector of Mulcture' as their agent. In 1734, the collector was one Andrew Muirhead, a former Baillie and former Town Treasurer. As a result of an act of the Town Council in 1731, part of the mulcture was used to pay the stipend of the third minister of Stirling, one Ebenezer Erskine, who was a central character in the events of 1734 and for some years thereafter.

As well as commercial implications, the royal charter of the town gave its citizens political privileges. They had their own town council to run the town and the town council elected a delegate who had one of five votes in the election of a member of parliament[1]. This does not imply, however, that Stirling was a democracy, for it was not. Reins of power were firmly grasped in the hands of a small proportion of Stirling's three and a half thousand inhabitants.

Broadly, there were four classes in Stirling society: the Guildry, the Trades, the Tolerated Communities, and the rest[2]. The Guildry were, in

theory, the merchants of the town, the burgh's artistocracy. So powerful were they that the landed gentry of the surrounding countryside found it expedient to join. The easiest mode of entry was by birth. The entry fee for the son of a gildbrother was much less than for anybody else. Next easiest was by marrying the daughter of a gildbrother. Marriage to the boss's daughter was an attractive course for any apprentice. Outsiders had to pay heavily for the privilege of joining and in addition had to show substantial reserves of capital. In return the gildbrothers had commercial protection and political power.

The next group were the Seven Incorporated Trades: being the local bakers, fleshers, hammermen, shoemakers, skinners, tailors and weavers. They had lower entry fees than the Guildry, but on the same pattern. They acted for the mutual protection of tradesmen and would allow no rivals in the town. Their numbers varied between twelve and 70 members, with the weavers being the most numerous.

These two groups were the burgesses. They had votes in council elections. The four Tolerated Communities, the barbers, mechanics, omnigatherum and maltmen, had no vote but had commercial protection and were consulted by the council on certain matters. The rest of the population, probably three-quarters of the total, had no say in the town and were largely restricted to being the employees of others.

It was possible to be a member of more than one group. Among the Tolerated Communities, the maltmen in particular were likely to be well off members of the Guildry. The Collector of Mulcture was a maltman as well as a gildbrother. His ally, William Maiben was a barber, but a gildbrother as well being the town postmaster and the custodian of the Edinburgh newspaper to which the council subscribed. The Town Council had twenty-one members. Seven of these were drawn from the seven Trades and were the Deacons of each trade. Amongst themselves they formed the Trades Court to manage their own affairs under the Deacon Convener. The other fourteen members all came from the Guildry and included the Provost, the Dean of Guild, the Treasurer and the four Baillies. The remaining seven were called 'Merchant Councillors' and were considered a cut above the trades councillors. The real power in the council was not the Provost who had honour but no duties, but the Dean of Guild who acted as praeses or chairman. The four baillies acted as magistrates for the four quarters of the town.

In its method of election, Stirling's council was, on paper, slightly more democratic than other burghs. In Edinburgh, every September the Town Council 'elected' the Town Council for the following year, which was usually very similar to the council of the previous year. In Dingwall, the rules decreed that two members out of the fifteen had to retire each year. In Stirling a great scandal at the end of the seventeenth century had resulted in a new

'sett' for the burgh, the sett being the rules by which elections were governed. What had happened was that one of the baillies had brought it to the attention of the Court of Session that half the Town Council of Stirling were members or in-laws of the Russell family and they were carving up the assets of the town amongst themselves'[3]'.

Thereafter, half the council, seven merchant councillors and alternately three or four of the trades councillors had to retire each year. As well as this, the office bearers could hold their office for only two years at a time and then retire or move to a different office. What happened, naturally enough, was that a small group continued to hold power within the council, remaining councillors at will, switching the prestigious offices amongst themselves while the councillors to be 'cut' were those out of favour or those who were happy to be in and out of power in alternate years. Thus a list of members shows some names appearing occasionally, some only once, some in alternate years, and a core almost every year. John Gillespie, a physician, came onto council in 1734 and remained for twenty years with only one year's break. Family groups tended to be found too. In 1734 for example the council included brothers James and John Gibb, together with a brother-in-law William Wittit, and James Alexander who was either a brother-in-law or son-in-law of John Gibb. This group, together with their friends, formed the party in power. Other families, such as the Christies and the Gillespies were also prominent in council affairs through many years.'[4]' and Appendix. In parliamentary election years, which normally fell at seven year intervals, the Town Council selected one delegate to cast a vote in the election for the Stirling Burghs seat. Four other burghs did the same, namely Dunfermline, Culross, South Queensferry and Inverkeithing. The actual election was held in each of the burghs in rotation, with the delegate from the 'home' burgh acting as returning officer. Thus the council elections of the year preceding a parliamentary election had more than usual importance.

So much for the political make-up of the town. Commercially, the town was mixed but owed much of its prosperity to the presence of a garrison in the castle which required to be fed, clothed, shod and, it must be admitted, provided with less respectable services. Brewing was a major source of income, hence the wealth of the maltmen, so was weaving and the commercial influence of the castle meant that the government could use supply contracts to influence councillors. Could, and did. On one occasion, the Deacon of the Cordiners, or shoemakers, effectively sold his vote in exchange for an order for several hundred pairs of shoes. On the other hand, in times of peace, the soldiers sometimes pursued trades such as cobbling in direct competition to the townspeople.

The events of 1734 involved politics and the church. There was only one church in Stirling at that time, what is now the Holy Rude. Up until 1732 only half was used and it had two ministers, Alexander Hamilton and Charles

Moore. Hamilton was an old man. In an earlier generation he would have been a Covenanter, and indeed, as a student he had removed the head of a convenanting martyr from where it was displayed in Edinburgh to give it decent burial'[5]'. As the martyr was an earlier minister of Stirling, Hamilton was highly thought of locally. The other minister, Moore, was quite different. He came to Stirling on the recommendation of the Duke of Argyll and at that time such a recommendation carried the weight almost of a royal command. He seems to have been unpopular and theologically was alien to the views of most of his parish. The Church of Scotland was split into two factions at that time, 'moderate' and 'evangelical'. Most Stirling folk belonged to the latter, Moore with his aristocratic patron, was a moderate. He was incidentally, the grandfather of General Sir John Moore who died at Corunna during the Napoleonic Wars, one of Scotland's greatest soldiers.(6)

As mentioned earlier, a third minister was appointed in 1732 — Ebenezer Erskine was a leader of the evangelical wing of the church and always at loggerheads with the ruling group who were moderates. Partly this was simply a conflict of religious views, but politics too came into it. The General Assembly of the Church of Scotland, although in theory democratic to the extent of having every parish minister and an elder from every parish as potential members, was, it has to be admitted, a tool of the civil establishment. Few members came from distant parishes; few could afford to. Edinburgh men, then even more than now, were in control. The elders appointed were also often resident in Edinburgh. There had grown up the habit of appointing Edinburgh lawyers as commissioners, and they were usually members of the political establishment. They had the ear of the Assembly, and much of the influence.

For some years, Stirling's elder was one of these lawyers, James Erskine of Grange. As Lord Grange, he was a judge of the Court of Session. Indeed, twenty years earlier he had been Lord Justice Clerk of Scotland.

But he was a maverick, for he was one of the few judges to be evangelical in his religious beliefs. He was a maverick in other ways too. Nowadays he is chiefly remembered for having his wife kidnapped and settled on St. Kilda while he announced her death/7' She was admittedly an unpleasant woman; she is said to have married Grange at gunpoint, she holding the gun. As her father had been executed for murdering the Lord President of the Court of Session, Grange had good reason to respect her aim, although his father-in-law's history can hardly have helped his own career as a lawyer. However, Grange owed his legal advancement not to his ability but to the fact that until the death of Queen Anne, his brother the Earl of Mar was the most powerful man in Scotland. With the accession of George I, Mar's influence waned and died, Grange lost his position as Lord Justice Clerk and his brother was led into Jacobitism, the fiasco of Sheriffmuir, and exile. Grange claimed to be a staunch Hanoverian, but had an ambiguous attitude to the Jacobites and was in regular contact with them. This

was odd, even allowing for family loyalty, in the light of his ultra-protestant beliefs. However, he also had an ambiguous attitude to morals. One younger contemporary described him as:

'passing the day in meetings for prayers and pious conversation, and his evenings in lewdness and revelling'[18]'

For all that, he was a friend of Ebenezer Erskine, who was a distant cousin.

That then is the broad picture of the situation in Stirling at the beginning of 1734. The question is, what made that year in particular significant? The answer lies in national politics, for it was a parliamentary election year, and, for the first time in many years, the government under Sir Robert Walpole was vulnerable.

Most of the histories of the time note that Walpole's popularity had slumped and ascribe his vulnerability to the 'Excise Question'. In Scotland, this meant the application of the higher English rates of Excise duty which would put up prices. There had been riots in Glasgow in 1726 over this very question, and the new act of 1733 was equally unpopular. The matter alienated many of Walpole's supporters in Scotland and they grouped into a new party with those who had always opposed him. This was variously called the 'Country Party', the 'Patriots' and the 'Squadrone'. However, although history books stress the importance of the 'Excise Question' as though it was of burning importance to all, there is evidence that it was in fact rather remote to the people of Stirling. In December 1733, Erskine of Grange wrote to one of his friends:

'the spirit is certainly rising in this county and will rise if due care and diligence be used. (The matter) of the excise but begins to be known amongst most of our people and it offends them highly'[9]'

So clearly it needed a deliberate campaign to raise public opinion against the measure. Grange has been mentioned as Stirling's elder at the General Assembly; that quotation shows him in a different role. By that time he was the parliamentary candidate for the Stirling burghs in the parliamentary election, standing as a 'Patriot' against Walpole's interest. This undoubtedly had Walpole worried. As soon as he heard of Grange's intention, he had Parliament rush through an act forbidding judges from standing for parliament. Grange was left with a dilemma; whether to lose all chance of political influence and remain a judge, or give up the bench in the hope of better things. He hoped that if the Country Party came to power, he would become Secretary for Scotland. This would have given him the power of making a large number of appointments at considerable profit to himself. So confident was he that he resigned from the bench to become an advocate again. At the time this was an unprecedented move.

If Grange saw himself as the potential Secretary for Scotland, Walpole too recognised him as his chief enemy in Scotland. So did Walpole's Scottish allies,

Earl Islay and his brother the Duke of Argyll. For that reason, wherever Grange stood for parliament would be a crucial seat to win.

It is not entirely clear why Grange chose the Stirling burghs. The sitting member was his nephew Thomas Erskine, son of the exiled Earl of Mar. He was persuaded to shift his candidacy to the seat of Stirling County to make way for his uncle. There was goodwill for Grange in the town, after all he was 'their' elder in the General Assembly, and had supported 'their' minister Ebenezer Erskine, in his battles there. On the other hand, Thomas Erskine had the support of any with Jacobite sympathies as well as other opponents of Walpole, and these Jacobites or crypto-Jacobites were in the county constituency. With the Mar estates in Clackmannanshire there was another option. One of the peculiarities of the system was that elections were not simultaneous and thus failure in one seat simply made the candidate shift to another, if he had the money. The Stirling Burghs seat was decided before the Clackmannan County seat thus giving Grange a second opportunity there if necessary/[10]'

Mention has been made of Ebenezer Erskine's battles in the General Assembly and this requires some explanation. The burning issue in the Church at the time was patronage, the question of who appointed ministers. The evangelicals, including Erskine, believed that a congregation should have the right to choose its own minister; the law decreed differently. An Act of Parliament of 1712 gave the right to patrons, as in the Church of England. Sometimes the patron was a local landowner, sometimes a town council, sometimes the crown. The moderates accepted this and made arrangements in the Assembly to allow for disputed presentations. This happened in 1732 and represented a change of attitudes. Broadly, up until that time the Assembly annually complained about the imposition of the Patronage Act but tacitly accepted it and worked under it. The Act of Assembly in 1732 effectively made the acceptance formal. At this time, Erskine was moderator of the Synod of Perth and Stirling and at the first meeting of the Synod after the act was passed he spoke out against the act in no uncertain terms. His sermon, given to the ministers and elders of three counties, preached the essential equality of all men before God; wealth and ostentation should give no extra rights. This sermon caused great offence and as a result he was censured first by the Synod, then by the General Assembly which ordered him to appear before a Commission of Assembly in August 1733. Grange spoke on his behalf, for he was a member of Commission, but so was his enemy Lord Islay and his forces won. Erskine was to be suspended from his charge. In December, Erskine and three other ministers seceded from the Church of Scotland and formed themselves into an 'Associate Presbytery'. It reflects oddly on the standards of the time that he remained in possession of the same church building and continued to draw his stipend. In fact he continued to do so for seven years.[(11)]

Erskine's chief opponent in the Commission had been Lord Islay. He was the man who ran Scotland for Walpole. He sweetened the powerful with profitable

offices, Collector of Taxes, Justice of the Peace, Sheriff; he got commissions in the Army for their eldest sons, he got parish churches for their younger sons; he kept the whole country peaceful so that it could be safely ignored by the government in London. Meanwhile in London his elder brother, the Duke of Argyll, the first Field Marshal in the British Army, looked after Scottish interests there.

Nationally, therefore, there was a clear polarisation; enmity in politics made for enmity in church affairs and vice versa. Grange opposed Islay in both spheres, Erskine as an opponent in the Church was by that fact an opponent politically. Locally too there was a polarisation. If Grange had considerable influence in Stirling, so had Islay. Argyle's Ludging was one of the many Campbell homes let out to cousins who could look after the family interest and act as agent. The Campbells thought of Stirling as one of their properties, and Grange's action in standing for Parliament there could be seen almost as an insult.

The parliamentary election was dependent on the five single votes of the delegates. Thus the composition of the town council who chose the delegate was critical, and so the election of 1733 was a major factor. It did not settle the matter by any means for councils were not normally elected on strictly party lines and councillors could be influenced. In November 1733, Grange was able to write:

'My affair seems to take very well in Stirling and I think must seem sure were it not for one sly underhand fellow'[12]

Presumably this was ex-Provost Littlejohn, for some months earlier Grange had written of him:

'Littlejohn, the present provost, pretending to be our friend is indeed Cunningham's man'[13]

Bribery was in evidence; the Deacon of the Fleshers was tempted by the offer of 'sixteen fat wethers' to vote for Littlejohn's party. Unfortunately for him, he was also misguided enough to try for a higher bid from the other side with the result that

'None in the town will drink a chopin of ale with the fellow or keep company with him'[14]

Tempers were getting frayed; a leading government supporter was one James Christie and he complained that he had suffered attacks on his house for which he had got no redress from the magistrates. He was a clothier to trade and that year found that his business fell by two-thirds because of a boycott by Grange's supporters. This James Christie was rather a character; a series of letters exists from him to Lord Islay over ten years showing ways that he could influence affairs in the government's favour. Curiously every

suggestion would also bring a large profit to Christie. He had the idea of leasing the King's Park; 'If I were master of the King's Park' he wrote, 'I could use it to influence the Town Council by giving and withholding grants of land.' Some of the letters read quite funnily. In 1737 he wrote that he had intended to send Islay some pineapples from a new shipment but The Customs House officers have robbed me of all my fine sweetmeats'.(15)

To return to the election of 1734, Ebenezer Erskine used his influence on Grange's behalf and preached his cause literally both in Stirling and in Culross, as did his brother Ralph in Dunfermline.

On the other hand, government supporters tried to use Erskine against Grange. Forged sermons supposedly by him were circulated in order to try to discredit him and it was hinted to some of the councillors that things might go easier for Erskine in the General Assembly if the government candidate won the election as follows: 'Stirling; Wed. Jan. 2nd 1734.

Whereas some persons for private gain or some other end have published two editions of a paper intituled 'the character of a soul espoused to Christ' under the name of a sermon preached by Mr Ebenezer Erskine one of the ministers of Stirling, at Edinburgh on 6th March 1733, by which the truth is abused, the world imposed upon and injury done to Mr Erskine's character; and two hawkers having on Friday last in our public market openly cried and sold copies of the said spurious paper; to put an end to such impostures, the said hawkers were at Mr Erskine's desire seized, the suppositious papers burnt and upon their enacting under a penalty to publish no more of these papers, were dismissed. The genuine sermon preached at the time foresaid upon Cant. 8, 5 is to be published with the title 'The believer's journey through the wilderness to the Promised Land'(16)

When these attempts failed, the threatened suspension of Erskine from his charge was attempted. A minister was commissioned to go to Stirling and serve the suspension order on him. The timing of this move, April 1734, suggests that the intention was to cause a riot in the town which could give the excuse for suspending the Town Council. That was certainly the belief at the time. In the event, the minister was 'persuaded' not to go to Stirling. 'A riot', Grange wrote to a friend, 'would make the magistrates liable and give a handle to Lord Islay to disturb the election'.'17' The attempted suspension of another of the Seceding ministers, William Wilson in Perth, gave rise to this report in the *Caledonian Mercury:*

'Mr Adam Fergusson was met in the suburbs of Perth by several of the inhabitants though attended by several armed men, yet they were all severely cudgelled and obliged to retire re infecta'<18) Earlier the same year, an 'intruded' minister for the Parish of St. Ninians, Mr James Mackie, had been met by a large body of parishioners intent on preventing his induction to the church. Religious rioting was a relatively frequent occurence at the time.

All the attempts to win Stirling over for the government failed; Provost

Wingate was Grange's chief supporter and he was chosen the delegate for the election by fourteen votes to seven. His rival, James Littlejohn the former Provost, was pledged to the support of Islay's candidate, Peter Halkett.

One of the surprising aspects of this period in Stirling's story is the number of actual letters which survive, and in them the same names appear over and over again, so that a picture can be built up of the way the townspeople thought. For instance, one of Ebenezer Erskine's opponents in the town was a barber, William Maiben late Baillie. A letter to Grange from the magistrates of the town in 1731 had sought his support in gaining the post of postmaster of the town for Maiben/[19]' At this point, Grange had influence and Maiben duly became postmaster. However, by 1734 Maiben and Grange were on opposite sides and Grange had to give instructions that letters intended for him in Stirling should not be addressed to him direct, for fear of being opened, but should be sent to 'John Gibb, late Baillie in Stirling with a coarse country hand'.'[20]' This John Gibb was Ebenezer Erskine's most loyal supporter in the congregation, and indeed Erskine lodged with him and even asked him to be witness at his daughter's baptism. Gibb was in contact with Grange and provided local intelligence when Grange was away from the town.

Amid all the plots and counterplots, the election took place. Stirling, in the person of Provost Wingate, declared for Grange as did the delegate for South Queensferry. Grange himself managed to be elected delegate for Dunfermline so should have had a clear majority. However, the returning officer was the delegate for Inverkeithing and he not only voted for Halkett, he challenged two of Grange's votes and as returning officer declared them null and Halkett elected by two votes to one. The election, in a word was rigged in the government's favour.'[21]'

Not surprisingly the result was challenged by petition to Parliament. Equally unsurprisingly the government, which had held on to power nationally, allowed the result to stand. Nonetheless, Grange still had an opportunity to stand for the Clackmannanshire seat and duly entered Parliament as MP for that constituency. His nephew Thomas, standing for Stirling County was less fortunate and did not re-enter Parliament until 1747.

That might have been the end of the affair. The election was over, the next council election in September 1734 could revert to local issues. However it is clear that the bad blood lingered in the town.

The most obvious sign of this was in the results of that election. A newspaper of the time *The Thistle* tells us that all Littlejohn's supporters were turned out from the council; and certainly the Dean of Guild, three baillies and ex-provost Littlejohn all left the council at this election, while John Gibb and his friends were left firmly in control.(22) The evidence for this is partly indirect. The baptismal records of Stirling give details of children's parentage, but they also give the names of witnesses to each baptism. Sometimes the witnesses were obviously relatives, grandparents, uncles or cousins of the child, but at other times there seems no such connection.

In these cases there is a strong argument that bonds of personal friendship were involved. By following the records over several years a picture of friendships can be built up and different parties in the burgh identified.[23]

Gibb, therefore, was left in control, but Littlejohn did not give up easily. He had realised early on what was likely to happen and had taken advice. That advice was to make a separate election in the same room and vote against the majority in everything. They voted themselves a completely different council and claimed that enough of their opponents' votes were invalid to make their council the legal one. Thus there were two groups of men both claiming to be the Town Council of Stirling.

This in itself was not unique. Dingwall had two rival councils operating for several years in the 1720's, while after the same election date of 1734, the town of Haddington had two councils alternately in power and in jail for some days. It all makes modern elections seem rather spiritless.

A month after the election was King George II's birthday. It was the habit for the magistrates to invite all the gentry from round about to celebrate the birthday together and drink toasts to the royal family round a great bonfire in Broad Street. The bonfire then served as a focus of the townspeople's festivities. In 1734, only those who opposed the government accepted the council's invitation, the others accepted a rival invitation from Charles Campbell to a bonfire at Argyll's Ludging. The official party included in their toasts the sentiment 'Liberty, Property and No Excise' and sported the same slogan on cockades. Having drunk their public toasts, they then retired to the Tolbooth presumably for dinner before the gathering broke up around nine o'clock. The bonfire was left in the care of the townguard, numbering about twenty. Shortly after midnight, the party from Argyll's Ludging came down the street in a body about thirty or forty strong. Some of the party went into the Town Clerk Nicol's house which was a tavern, but others decided they would go down to the bonfire. Two of the party had been heard to plan to pick a quarrel with the town guard, and that is what happened. A fight broke out and the rest of the revellers in Clerk Nicol's House came out to join the melee while many of the townspeople came to the assistance of the guard. Although swords were drawn most of the fighting involved staves and other blunt instruments so that none was killed and few seriously wounded. When the rioters retired once more to the safety of the Town Clerk's house, they were besieged and when a squad of soldiers came down from the castle, they too were put to flight by the townspeople. Riots were not particularly rare, however, what made this one out of the ordinary was the social standing of the rioters, for they included the MP for the county, Sir James Campbell, Gabriel Napier of Craigannet, the Sheriff of Stirlingshire, an advocate, Patrick Haldane, various other landowners including Sir James Stirling of Glorat, two or three army officers from the Castle, the Comptroller of Customs at Alloa, and ex-provost Littlejohn. It must have been the social event of the year. The riot apparently lasted several hours and ended with a

Justice of the Peace, Thomas Forrester of Denovan, in the Tolbooth.[24]

The magistrates did read the Riot Act and finally the fracas worked itself out. However the aftermath reverberated for months, for representatives of each side took the others to court in a long series of actions. Sir James Campbell, Napier of Culcreuch, Forrester of Denovan and several others tried to sue the Provost, the four baillies, the Dean of Guild, the Procurator Fiscal, the Captain of the town guard, various members of the guard, and indeed anyone else they could think of. Meanwhile, the Provost, the Baillies and so on counter-sued. The town council had the bills to pay and fell substantially into debt as a result. All these cases were heard in Edinburgh over the next few months, but no verdict was reached. Apparently there was a measure of 'horse-trading', for the processes the government supporters had started to overturn the election in September were quietly dropped, and the riot cases sank into oblivion.

The town council paid various small sums to those who had been 'inconvenienced' by the cases on both sides. The town had been lucky in one respect, they had no advocate's fees to pay, for their case was presented by James Erskine of Grange now picking up his career as an advocate and eager for cases to boost his reputation. As a reward, he was made an honorary burgess and gildbrother of the town and indeed he then stood for the council and on his election became provost in 1735.

1734 was then a turbulent year for the Royal Burgh of Stirling. Bad feelings were created which took a long time to disperse. Throughout the political wrangling, the religious battle continued. The same divisions suffered in the Town Council appeared in the Kirk Session, for in many cases the people were the same. The government certainly thought that the riot of October could be laid at the door of Ebenezer Erskine. A letter written to Lord Islay from a judge, Lord Milton, refers to the council side in the fracas as 'Ebenezer Erskine's people' and commented that they were not averse to perjury.'[25]' The Secession continued. Although Erskine had joined the Associate Presbytery, it was not until 1738 that his congregation formally joined him and not until 1741 that they gave up their use of the Holy Rude church.

Writing in December 1734 to Charles Campbell, tenant of Argyll's Ludging, and Islay's agent in Stirling, a correspondent wrote: 'It's very good that the Patriots (Grange and his supporters) have their languages confounded. May the good Lord write disorder and disappointment upon every measure tending to sap the foundation of what's dear to us men and Christians. I do what I am able to open the eyes of our misled people that they may not implicitly give in to the perpetual pernitious preachings of such as leave no stone unturned to inflame this poor place, nay the notion that they themselves have the helm to steer it to its ruin'[26]'

The writer was Charles Moore, one of the ministers of Stirling and his

'Pernitious preacher' was his colleague in the Holy Rude, Ebenezer Erskine.

Erskine himself remembered the year in the following terms, written as part of a religious document in 1738:

'We judge it proper to take notice of the unhappiness that fell out in this place in the year 1734, which time a party spirit entered in among us which in the righteous anger of God rent us to that degree as issued in tumults and shedding of blood and civil and criminal and expensive prosecutions to the draining of much of the public revenue and more private substance of the place. And we fear the guilt of much perjury in witness bearing contracted upon that occasion not duly considered and mourned over, and we judge the sad fruits of the above divisions are yet continued as is the spring of our shameful and sad animosities' (27)

1734 was a year long remembered in the town as one of the unhappiest of the century.

REFERENCES/NOTES

1. At this point Scotland's burghs shared members of Parliament in geographical groups. Thus Stirling was grouped with the burghs of Culross, Inverkeithing, Dunfermline and South Queensferry, and each burgh had one vote. All but the smallest counties had a member of Parliament; the exceptions had an MP in alternate parliaments. Although there was some pressure for triennial parliaments at this time, the elections were held at seven year intervals.
2. An examination of the details of Stirling at this time can be found in John G. Harrison's The hearth tax and the population of Stirling in 1691. *Forth Naturalist and Historian* 10, 88-109.
3. Miscellany of the Scottish Burgh Records Society, Edinburgh, 1881. pp 67-69.
4. Stirling Town Council. Register of elections of magistrates and town council, 1732-1825. Central Regional Archives. B66/22/1.
5. Donald Fraser. Life and Diary of the Rev. Ebenezer Erskine. Edinburgh, 1831. p330.
6. H. L. Fulton. The managed career of the Rev. Charles Moore of Stirling. *Records of the Scottish Church History Society* XX, 1980. pp 231-247.
7. William Roughead. The husband of Lady Grange, in The Riddle of the Ruthvens. Edinburgh, 1936. pp 57-76.
8. Alexander Carlyle. Anecdotes and Characters of the Times. London, 1973. pp 5-9, 30-32.
9. Grange to Marchmont 10th December, 1733. Historical Manuscripts Commission, Polwarth V. letter 114.
10. Clackmannanshire had parliamentary representation only in every other Parliament, hence it was a less attractive long-term proposition for a politician.

11. A. L. Drummond and J. Bulloch. The Scottish church 1688-1843, The age of the Moderates. Edinburgh, 1977. pp 39-44.
12. Grange to Marchmont, 1st December 1733. Historical Manuscript Commission Polwarth, V. letter 112.
13. Grange to Tweeddale, 26th August, 1733. National Library of Scotland, Yester 7044.
14. Grange to Tweedale, 9th January, 1734. National Library of Scotland, Yester 7044.
15. James Christie to Lord Islay. National Library of Scotland, Saltoun Msl7,700/56 etc.
16. Caledonian *Mercury,* 10th January, 1734.
17. Grange to Mungo Graeme of Gorthie, 5th April, 1734. Scottish Record Office, GD220/5/1286/4.
18. Caledonian *Mercury,* 2nd April, 1734. Quoted in text.
19. Magistrates of Stirling to Grange, 16th November, 1731. Scottish Record Office, GD124/15/1393.
20. Grange to Graeme of Gorthie, ? 1734. Scottish Record Office, GD220/5/1286/5 and John Gibb to Grange. 22nd March 1734. Scottish Record Office GD124/15/1432/1.
21. Ronald M. Sunter. Patronage and Politics in Scotland. 1707-1832. Edinburgh, 1986.
22. The *Thistle,* January, 1735, quoted in full in W. B. Cook. The Stirling Antiquary, Stirling 1893. I pp 70-83, 264.
23. Stirling Baptismal Roll, Scottish Record Office OPR 490/2.
24. The *Thistle,* January, 1735.
25. Milton to Islay, March 1735. National Library of Scotland, Saltoun MS16559/102.
26. Moore to Captain Campbell, 4th December, 1734. National Library of Scotland, Saltoun MS 16558/14.
27. Central Regional Archive, Stirling Kirk Session CH2/1026/6 11th January, 1738.

Bibliographic Note

The material in this paper forms part of a thesis for the degree of M. Litt at Stirling University presented in 1983. Religion, politics and society in Stirling during the ministry of Ebenezer Erskine 1731-54, where a full bibliography will be found. Another part of the thesis dealing with the events subsequent to those in this paper is to be found in the Records of the Scottish Church History Society XXII, pp 211-233, A secession congregation in its community.

## FORTH NATURALIST AND HISTORIAN

A collaboration between some members of Stirling University and Central

Regional Council staff to promote interests and publications on central Scotland, historical and environmental. Since 1975 eleven Forth Naturalist and Historian volumes have carried some 150 papers; 14 Man and the Landscape annual symposia at the University have promoted numerous presentations and displays; and books produced or promoted include: Doune -postcards from the past; Muckhart; Doune - historical notes; Airthrey and Bridge of Allan; Making of Modern Stirling; Woollen Mill Buildings of the Hillfoots; Clackmannanshire - guide to historical sources; Alloa Tower; Mines and Minerals of the Ochils; The Stirling Region - the standard survey of the area; Index to the Stirling Journal 1820-1971. Enquiries/orders welcomed -Editor/Secretary Lindsay Corbett, Forth Naturalist and Historian, University of Stirling, FK9 4LA. Tel. Alloa (0259) 215091.

Mid 18th century Stirling. From plan in Burgh Minutes c 1800 by McDonald, Ronald and Galbraith

BOOK REVIEW

**A SENSE OF PLACE - studies in Scottish local history**

## APPENDIX

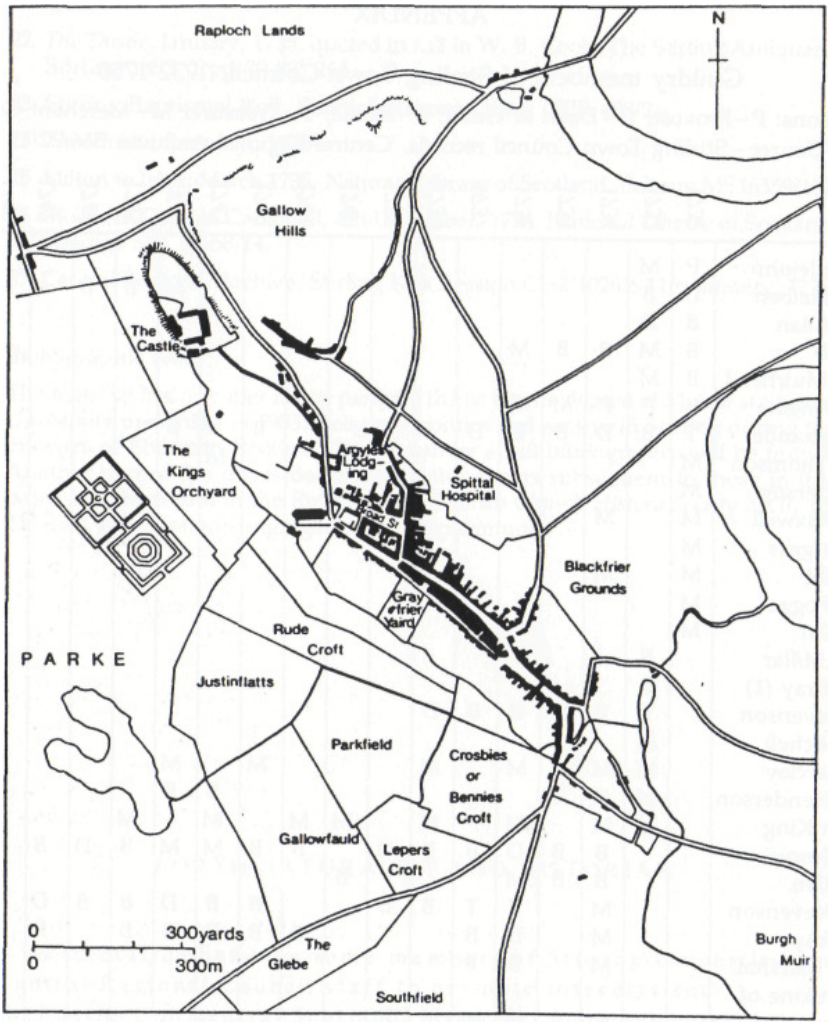
### Guildry members of Stirling Town Council, 1732-1750

Abbreviations: P – Provost; D – Dean of Guild; B – Baillie; T – Treasurer M – Merchant Councillor
Source – Stirling Town Council records, Central Regional Archives B66/22/1

| | 1732 | 1733 | 1734 | 1735 | 1736 | 1737 | 1738 | 1739 | 1740 | 1741 | 1742 | 1743 | 1744 | 1745 | 1746 | 1747 | 1748 | 1749 | 1750 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| James Littlejohn | P | M | | | | | | | | | | | | | | | | | |
| William Maiben | D | B | | | | | | | | | | | M | B | B | | | | |
| William Allan | B | D | | | | | | | | | | | | | | | | | |
| John Gibb | B | M | B | B | M | | | | | | | | | | | | | | |
| Andrew Muirhead | B | M | | | | | | | | | | | | | | | | | |
| Robert Wingate | B | P | P | M | M | | | M | | | | | | | | | | | |
| James Alexander | T | B | D | B | B | D | | | | | B | B | B | | | | | B | D |
| Thomas Thomson | M | | | | | | | | | | | M | | | | | | | |
| John Anderson | M | | | | | | | | | | | | | | | | | | |
| Patrick Maxwell | M | | M | | | | | | | | | | | | | | | | |
| James Burgess | M | | | | | | | | | | | | | | | | | | |
| James Gibb | M | | M | | | | | | | | | | | | | | | | |
| William Foggo | M | | | | | | | | | | | | | | | | | | |
| John Dollar | M | | | | | | | | | | | | | | | | | | |
| Andrew Millar | | B | | | | | | | | | | | | | | | | | |
| James Jaffray (1) | | B | | | | | | | | | | | | | | | | M | |
| James Stevenson | | T | T | M | B | B | D | | | | | | | | | | | | |
| James Mitchell | | M | | | | | | | | | | | | | | | | | |
| Robert Barclay | | M | M | | M | | M | | | | M | | M | | | | M | M | |
| George Henderson | | M | B | D | | | | | | | | B | B | | | | | B | B |
| Murdoch King | | M | M | | M | | M | | M | M | | M | | M | | | | | |
| John Gillespie | | | B | B | D | B | B | D | | B | B | M | M | B | D | B | B | D | B |
| Harry Allan | | | B | B | M | | | | B | | | | | | | | | | |
| Patrick Stevenson | | | M | | T | T | B | B | | | B | B | D | B | B | D | B | | |
| John Jaffray | | | M | | B | B | | | | B | B | D | B | B | | P | P | M | M |
| Andrew Marshall | | | M | | B | B | | | | | | | | | | | | | |
| James Erskine of Grange | | | P | P | M | M | P | P | | | | | | | | | | | |
| John Cowan | | | | T | | | | M | M | M | | | | | | | | | |
| Edward Main | | | | M | | M | | | | | | | | | | | | | |
| Robert Willison | | | | M | | M | | | | | | | | | | | | | |
| Thomas Glen | | | | M | | M | T | T | | M | | | | | | | | | |
| James Jaffray (2) | | | | M | | M | | | | | | | | | | | | | |
| William Wittit | | | | M | | M | | | | | | | | | | | | | |
| James Neilson | | | | | M | | M | | | | | | M | T | T | | | | |
| William Burn | | | | | M | | | | | | | | | | | | | | |
| Thomas, Lord Erskine | | | | | | P | P | M | M | | | | | | | | | | |
| James Walker | | | | | | M | M | | T | T | | | | | | | | | |
| Thomas Christie | | | | | | | B | B | D | | | | | | | | | | |

This is a most attractively produced publication full of clear and

interesting illustrations, some in colour; maps - although those promised on the end papers are missing - and useful tables and charts. It is the work of many contributors and the range of expertise is evident. For example in the




chapter on 'Life in the Parish' which is a survey from pre-History to 1986 there is a clear awareness, so often sadly lacking in local histories, of life beyond the parish boundaries. This is demonstrated by such observations as the effects of Imperial Preference on local farming in the 1930s and what 28 names on the World War I memorial meant in actual demographic terms to a

parish with a total population of 1085.

Overall this is an invaluable publication and should serve as a model for other Scottish parishes wishing to produce an up to date account of both their natural and man-made environments.

**MERCAT CROSS AND TOLBOOTH** Craig Mair
John Donald, Edinburgh 1988. 232 pages. £7.50. ISBN 085976 1976.

Craig Mair's book is a comprehensive and well organised study of Scottish burghs in the 17th century between the Union of Crowns and the Union of Parliaments. It draws examples from all parts of Scotland and is supported by photographs (mostly taken by the author), line drawings and maps. As would be expected of an experienced principal teacher of History, Craig Mair's writing is a model of clarity and concise detail and full of interesting examples; the chapters on judical punishments and medical matters are particularly chilling in the latter respect.

This book is clearly a work of love and labour. In a field which encourages so much amateurism and antiquarianism it is heartening to see from time to time the pubication of scholarly work such as this which nevertheless can still be enjoyed by a wide readership.

B. J. Elliot

students of all ages from wherever they come, and in the past eleven years they have come from England, Wales, America, Australia, Belgium, Canada, Corsica, Denmark, Finland, Germany, Holland, Iceland, Italy, New Zealand, Norway, Sweden and Switzerland.

Schools will be held in all the usual subjects: traditipnal fiddle, accordion, bagpipe and clarsach **playing**, Scottish and Gaelic singing, Scottish traditional and Highland dancing. Tracing Your Ancestors, piano accompaniment, Roman Scotland, Scottish Folk traditions, handwriting and calligraphy, plus various Scottish crafts, including Fair Isle knitting. New schools will include Shetland spinning, Scottish theatre, flute and cello playing.

**Further particulars, including separate leaflets on each school may be had from:— Robert Innes, Queen Margaret College, Clerwood Terrace, Edinburgh. Telephone: 031 339 8111 or 0786 83 2333.**

**Editorial Note:** papers in hand or expected for volume 12, for publication summer 1989, or **volume** 13 spring 1990. Climate and Bird reports for 1988 and 1989; Dutch Elm disease in C. Scotland by Ruth Neiland and J. W. Shepherd - the position 10 years on from our paper in volume 2; Flowers of West Fife by G. Ballantyne; Migrant birds in the Ochils by C. Henty; Moorland birds . . . by D. A. Stroud; Scottish enclosure landscape - a farmer's view by L. Stewart; Royal guest at Alloa Tower in 1566, and Dickens at Bridge of Allan and Stirling by D. Angus; Rise and fall of rail and coal industries of Clackmannanshire by B. J. Elliott; Stirling Community Heritage Project by A. T. N. Muirhead; Andrew Meikle by N. Cartwright; David Bruce - medical years by Dr Follet. And more in prospect! and welcome!

*Doune - postcards* from *the* past has had to be reprinted. We have reprinted *Muckhart* for Muckhart and Glendevon Amenity Society.

*The Ochil Hills - an* introduction is proceeding slowly in collaboration with Clackmannanshire Field Studies Society.

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