

## BRITISH RAINFALL 1959-60

### PART III

## SNOW SURVEY OF GREAT BRITAIN FOR THE SEASONS 1958-59 AND 1959-60

The reports which follow are the third and fourth annual reports of the Snow Survey of Great Britain to appear in *British Rainfall*. Previous annual reports, commencing with that for the season 1953-54, were also prepared by the Meteorological Office but were published in the *Meteorological Magazine*. Annual reports for the seasons 1946-47 to 1952-53 were prepared by the British Glaciological Society, from whom the Meteorological Office assumed responsibility for the Survey in 1953, and were published in the *Journal of Glaciology*.

The basic material for these reports has been obtained, as in previous years, from returns made by voluntary observers who have provided, month by month, daily records of snowfall and of snow cover within sight. These records, from a network of stations distributed over the country, have been augmented by data extracted from the monthly returns of official weather stations and voluntary climatological and rainfall stations reporting to the Meteorological Office. Without the co-operation of all those responsible for the voluntary observations, this report could not have been prepared in such detail.

The measurements of snow depth in the following pages refer, in general, to 09.00 G.M.T. or thereabouts.

#### Summary of 1958-59 Season

The season, taken as a whole, was mild and dry. Total precipitation, that is, rainfall and the rainfall equivalent of melted snow and hail,

was about 85 per cent of the 1916-1950 average over England and Wales and about 75 per cent over Scotland. Mean temperatures for the eight months showed an accumulated excess of more than 5°F. over England and Wales, where January was the only cold month, and more than 6°F. over Scotland, where both December and January were cold, the latter particularly so.

Data for ten\* representative stations in Great Britain at altitudes between 400 ft. and 1,200 ft. which have been used for seasonal comparison since the Survey of 1946-47, give for the 1958-59 season a mean of 23 days with snow lying at the morning observation. This is four less than the corresponding figure for the season 1957-58 and 12 less than the average for the 12 seasons 1946-47 to 1957-58. The snowfall of the present season was more than usually concentrated in December and January. February, often one of the snowiest months, was very dry in most places. As a consequence, most stations in England and Wales and at a number of low-lying stations in Scotland, even as far north as the Orkneys, had not one day during the month with snow lying at the morning observation.

The number of days with snow falling ranged from more than 50 in the Cairngorms and 40 or more in the Shetlands and the northern parts of the Western Highlands to less than 5 in coastal districts of south Wales and along much of the coast of south and south-west England, where in a few favoured places there was no snow throughout the



season. Days with snow falling exceeded 20 over the Southern Uplands, the northern Pennines, the Peak District and the mountains of north Wales. Most high ground above about 700 ft., excluding the hills of south-west England and south-west Wales, had at least 10 days with snow falling. So too, did many lower lying areas of the Midlands and most of East Anglia.

The seasonal duration of snow cover in the mountainous regions of Great Britain is summarized in Table 1 and illustrated for a selected number of these regions in Figure 2. At lower levels there were 20 to 30 days with snow cover in the Shetlands and parts of Staffordshire. Totals of 10 to 20 days were reported from coastal areas of northern Scotland, the north-east of England including coastal districts, parts of East Anglia, much of the Midlands and the Upper Thames Valley and also, from most of Wiltshire and adjacent parts of Berkshire. Snow lay on less than 10 days in other low-lying areas and parts of the south and west coasts of Wales, while large sections of the south coast of England did not report a single occasion with snow cover at the morning observation.

While in terms of days with snow cover the winter was less severe than usual for the country as a whole, there were, by this standard, wide variations in the severity of the winter in different parts of Great Britain. For example, the Hebrides, the Orkneys, the north coast of the Scottish mainland and much of Staffordshire had two to three times their normal number of days with snow lying. In contrast, large areas including parts of the Western Highlands, the Southern Uplands and the Pennines had less than their usual number of days with snow cover, while Dartmoor, particularly favoured, had only half the usual number.

#### *Notes on the months*

*September* was very wet in England and Wales, but Scotland had slightly less than average rainfall. It was warm generally, but fresh north-westerly winds on the 24th and

25th brought some snow showers to the highest ground in the Grampians and a little sleet fell at 2,000 ft.

*October* was wet and changeable during the first part of the month becoming dry later. It was generally rather mild with sunshine totals about average. There was no snow reported over England nor over Wales. Snowfall in Scotland was largely confined to the mountains in the north, although a little snow fell near sea-level in the Orkneys and in Caithness. Cold westerly winds on the 6th and 7th brought the first sleet and snow of the winter to a number of places in northern Scotland, but no snow settled below 2,500 ft. Further light snow showers occurred in the Cairngorms, Grampians and Western Highlands on the 10th and 11th and lay for a few hours at 2,000 ft. Strong westerly winds developed over Great Britain on the 15th and veered slowly to the north, bringing more snow showers to the north and east of Scotland, mainly in the mountains, although heavy sleet showers were reported near sea-level. Snow reached a depth of 18 inches at 3,000 ft. in the Cairngorms. After a mild, mainly dry spell, cold west to north-west winds on the 30th and 31st gave slight snow showers at heights of above 2,000 ft. in the mountains of northern Scotland.

*November* was generally dry with temperatures above average, particularly in the north. Snowfall, usually slight in this month, was rather below average. The snowfall of late October lay for a day or two in the mountains of north Scotland, subsequently clearing except at the highest levels in the Cairngorms and on Ben Nevis where in the latter area a cover remained for the rest of the season. A few isolated snow showers occurred at 3,000 ft. and above in the Scottish mountains on the 5th and 6th and there was more widespread slight snow in the mountains of central and northern Scotland as a small wave depression crossed the Southern Uplands on the 7th. Cold northwest to north winds behind the depression spread southwards over the whole of Great Britain and there were further snow



showers in Scotland. Little snow settled below 1,500 ft., even in the north, although sleet occurred near sea-level along the northern coast and in the Orkneys and Shetlands. Snowdonia and the Yorkshire Moors had their first snow of the winter—no snow settled in Yorkshire but a thin covering persisted for a few hours at 3,000 ft. in Snowdonia. A warm front moving eastwards on the 11th was preceded by snow over high ground from the Cumbrian mountains northwards. A quick return to cold north-westerly winds on the 12th brought snow showers to most of the mountains of Scotland, the Cumbrian Mountains and the Yorkshire Pennines. Although sleet showers occurred down to about 350 ft. above sea-level in the south of this area, very little snow settled below 1,000 ft., even in the north. Milder weather reached all areas from the west by the 15th, clearing all snow lying except over the highest ground in the north. Mainly dry weather with some fog and only a little rain, mainly in the west, followed for much of the remainder of the month. However, on the 29th the anticyclone which had for some time been centred to the east of the British Isles moved westwards and very cold northerly winds spread southwards over Scotland and eastern England. Some snow, falling as showers, settled at heights above 2,000 ft. in north and north-east Scotland.

*December* was wet and dull with a marked sunshine deficit over England and Wales. Temperatures were slightly above average in England and Wales, and rather below average in Scotland. Snow, in terms of days with snow falling and days with snow lying, was below average over most of Great Britain except in north-east Scotland. A ridge of high pressure over England and Wales gave widespread fog in southern and central districts during the first four days of the month. Cold north-westerly winds which reached northern Scotland early on the 4th spread southwards, clearing the fog from all areas by the 5th, and brought snow showers to the Orkneys, Shetlands and the mountains of Sutherland and Inverness-shire. Milder air spread eastwards

over the country on the 6th. Snow showers were renewed in the north as cold air spread south-eastwards on the 7th and subsequently affected areas as far south as the Midlands and north Wales, where, in Snowdonia, snow lay for a short time down to 600 ft. Depressions moving east-south-eastwards on the 10th and 11th brought snow to a wide area of the north Midlands, northern England and southern Scotland, snow showers continuing further north. Snow lay to a depth of 10 in. on the morning of the 11th at South Moorhouse (750 ft.), Renfrewshire, while a number of places at 600 ft. in Lancashire and the West Riding and at 1,000 ft. in County Durham reported falls of between 4 in. and 6 in. Vigorous troughs of low pressure associated with a depression to the west of northern Scotland moved east-north-eastwards across Great Britain on the 12th and brought rain to all areas preceded by some snow over the Scottish mountains. The depression moved slowly south-eastwards across northern Ireland and secondary depressions moved eastwards across southern districts. Cold east to north-east winds were gradually established over all districts except the extreme south. There were snow showers in many eastern districts between the 13th and 18th, with a few sleet showers in the Midlands and over the highest parts of Exmoor and Dartmoor. Although no very heavy falls were reported over low ground during this period, snow accumulated to appreciable depths in parts of the Scottish mountains. Around Glen Esk in Angus there was an average depth of 2 ft. to 3 ft. of snow at 2,000 ft. with drifts to 15 ft. Warmer air spread northwards over Great Britain on the 19th preceded by heavy rain, with some snow over parts of the Grampians. There was no further snow until the 25th when troughs moving from the west brought a little snow to the higher ground in Inverness-shire, Perthshire and Stirlingshire, but none settled below 1,500 ft. Scattered snow showers developed in the cold air behind the troughs. These were mainly confined to the mountains of eastern Scotland, where some fresh snow



Table 1. Number of days with snow lying in the British mountains

(a) near summit;  
(b) at about 2,500 ft.;  
(c) at station level.

		Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Season
Clisham and Roneval (2,622 ft.)	a	0	1	20	31	12	0	6	2	72
Station: Leverburgh, Harris (25 ft.)	b									
Inverness-shire	c		0	0	13	0	0	0	0	13
Mountains round Glen Lyon (3,407 ft.)	a	3	8	26	31	23	16	17	4	128
Station: Meggernie Castle (760 ft.)	b	3	7	26	31	18	7	15	4	111
Perthshire	c	0	0	6	24	0	0	1	0	31
Cairngorms (4,296 ft.)	a	12	11	31	31	28	31	30	15	189
Station: Achnagoichan (1,000 ft.)	b	2	6	28	31	26	22	18	6	139
Inverness-shire	c	0	0	11	28	2	0	2	1	44
Ben Nevis (4,406 ft.)	a	15	30	31	31	28	31	30	31	227
Station: Corpach (30 ft.)	b	0	2	24	31	27	2	10	3	99
Inverness-shire	c	0	0	1	20	0	0	0	0	21
Snowdonia (3,560 ft.)	a	0	3	18	21	0	1	13	3	59
Station: Capel Curig (640 ft.)	b	0	1	14	20	0	0	11	0	46
Caernarvonshire	c	0	0	1	18	0	0	0	0	19
South Snowdonia (2,527 ft.)	a	0	0	2	23	0	0	3	0	28
Station: Llanfrothen (475 ft.)	b	0	0	2	23	0	0	3	0	28
Merionethshire	c	0	0	0	8	0	0	0	0	8
Brecon Beacons (2,906 ft.)	a	0	0	8	31	22	0	4	0	65
Station: Tairbull (660 ft.)	b	0	0	8	31	22	0	4	0	65
Brecknockshire	c	0	0	0	11	0	0	0	0	11
Cross Fell (2,893 ft.)	a	0	5		31	1	1	7	1	
Station: Alston (1,070 ft.)	b	0	5	*	26	1	1	3	0	
Cumberland	c	0	0		20	0	0	0	0	
Helvellyn (3,118 ft.)	a	0	4	14	25	0	2	5	0	50
Station: Patterdale (520 ft.)	b	0	2	14	20	0	2	5	0	43
Westmorland	c	0	0	0	7	0	0	0	0	7
Skells Range (2,668 ft.)	a	0	0	14	28	0	0	4	0	46
Station: Dalry (Forrest Lodge) (500 ft.)	b									
Kirkcudbrightshire	c		0	3	8	0	0	0	0	11

\* No December observations available.

settled above 2,500 ft. Further troughs moving eastwards on the 27th and 28th were followed by a cold unstable westerly airstream which persisted in the north until the end of the month, although warm air spread back over the extreme south on the 31st. Snow showers occurred over high ground as far south as Durham on the 29th and Caernarvonshire on the 30th. Snow settled near sea-level in the north. In the south little, if any, snow settled below 2,500 ft.

January was a cold month, in a number of places the coldest since 1947, yet sunshine was above average. Precipitation was also above average in England and Wales but well below average in Scotland as a whole, though above average in the north. New Year's Day started mild in most areas, but a depression moved eastwards across Scotland during the day and cold north-westerly winds spread southwards to all areas before dawn on the 2nd. Rain associated with the depression turned to snow



in Scotland and snow showers followed, later affecting most northern counties of England, parts of north Wales and the north-west Midlands. North-westerly winds persisted for a few days and most parts of Great Britain except south-west England, south and west Wales, had further snow showers. Small depressions moving eastwards across southern England on the 5th and 6th brought periods of more continuous slight snow to central districts of England and Wales. Meanwhile snow showers persisted further north and once again spread south behind the depressions, affecting all areas by the 8th, and continued until the 11th. A depression then over Sweden turned south-westwards into the North Sea and the associated fronts moving south-westwards over Great Britain brought further snow and strong winds to many districts, followed by a renewal of cold showery weather. Appreciable snow depths had accumulated by this time, there being 12 in. lying near sea-level in Ross-shire, 14 in. at about 600 ft. in Sutherland, and 16 in. at about the same height in Nairn, with drifts of 3 ft. or 4 ft. Drifting was often severe and many roads were blocked, drifts to 8 ft. being reported at heights of about 1,400 ft. in Aberdeenshire. Further south snow depths were rather less and maximum depths occurred earlier in the month than in Scotland. Around the 11th a level fall of 4 in. was reported near sea-level in Anglesey and 10 in. at about 900 ft. in Denbighshire, with drifts of 2 ft. At the same time snow lay to a depth of 13 in. at 600 ft. in the North Riding, with drifts to 5 ft. in the hills. Drifts to depths of between 3 ft. and 4 ft. were reported from the Dunstable Downs, where level falls reached a depth of 8 in. Heaviest falls occurred around the 7th in the west and north Midlands—on this morning snow depths of 5 in. were measured at 600 ft. in Worcestershire and 9 in. at around the same elevation in Derbyshire. The north-westerly winds gradually decreased over Great Britain as troughs approached from the south-west. By the 13th snow showers were confined to the

extreme north-east although by this time a trough had moved into the western Channel bringing a little snow to Devon and Cornwall. A depression moving east-south-eastwards across the Breton Peninsula on the 15th brought snow and sleet to many parts of southern England. Falls were heavy in places, snow lying to a depth of 8 in. at 1,200 ft. over Dartmoor and 7 in. at 1,500 ft. over Exmoor. An anticyclone developed over Ireland in the early hours of the 16th and drifted slowly south-eastwards into the continent. Slight snow showers continued over north-east Scotland but elsewhere weather was fine and cold with moderate or severe frost in many central and eastern districts in the early hours of the 17th. Freshening southerly winds were followed by a trough of low pressure which, moving north-eastwards, brought rain and drizzle to most of Great Britain, with some sleet and snow over the mountains of northern Scotland. A well-marked warm front moved north-eastwards on the 18th, crossing all areas except the Shetlands, where winds freshened from the east and there was some snow. On the 20th and 21st a complex depression moved slowly eastwards across the British Isles, the snow in the Shetlands spreading slowly southwards to affect much of Scotland, northern England and north Wales, although precipitation was generally slight and confined to the east coast and the hills. Another depression near the Scillies early on the 22nd moved quickly north-eastwards and the cold air in the rear of this depression spread to all parts of the country, winds backing slowly from north-east to north-west as the depression receded. By the 23rd there were snow showers in most areas as far south as Gloucestershire, with a little snow at 1,500 ft. over Exmoor. Showers were slight over most of England and Wales, little snow settling over low ground. At higher levels falls of 3 to 4 in. were reported at about 1,000 ft. in north Wales and the Lake District. In north-east Scotland appreciable snow fell for the second time in the month, snow depths of 10 in. being reported at about



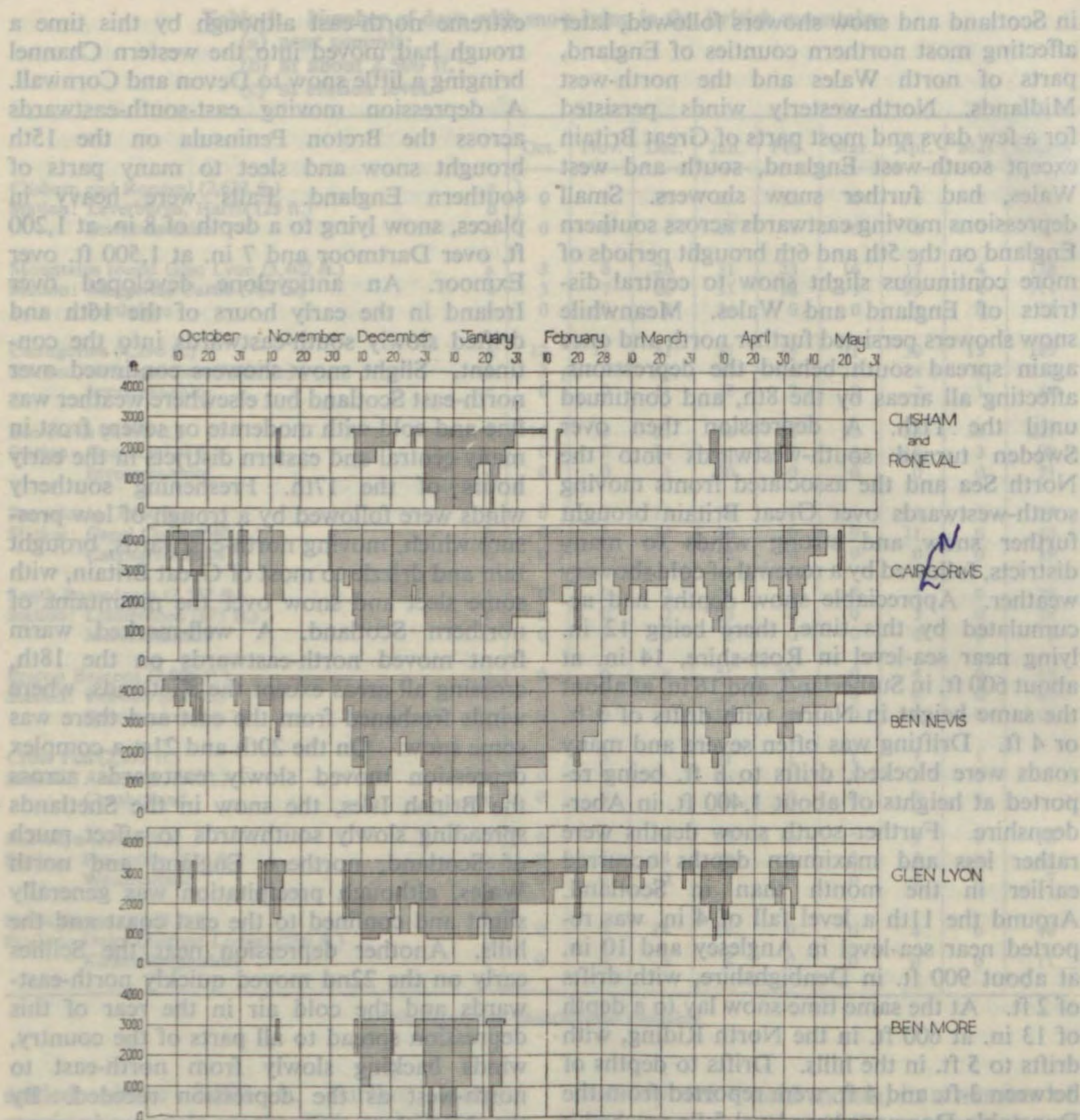


Fig. 1.—continued on next page.



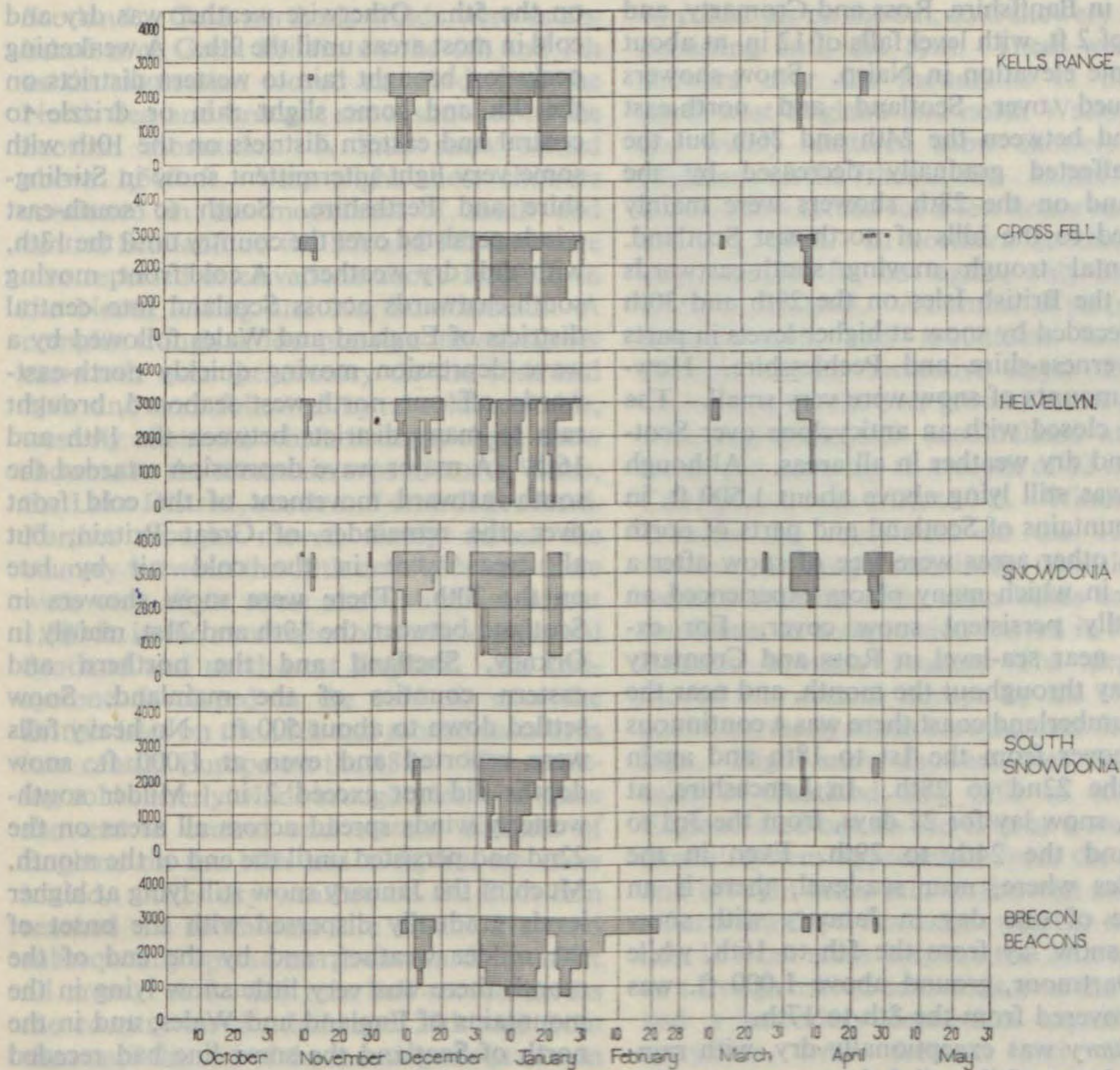


Fig 1. DISTRIBUTION OF SNOW COVER IN RELATION TO HEIGHT.

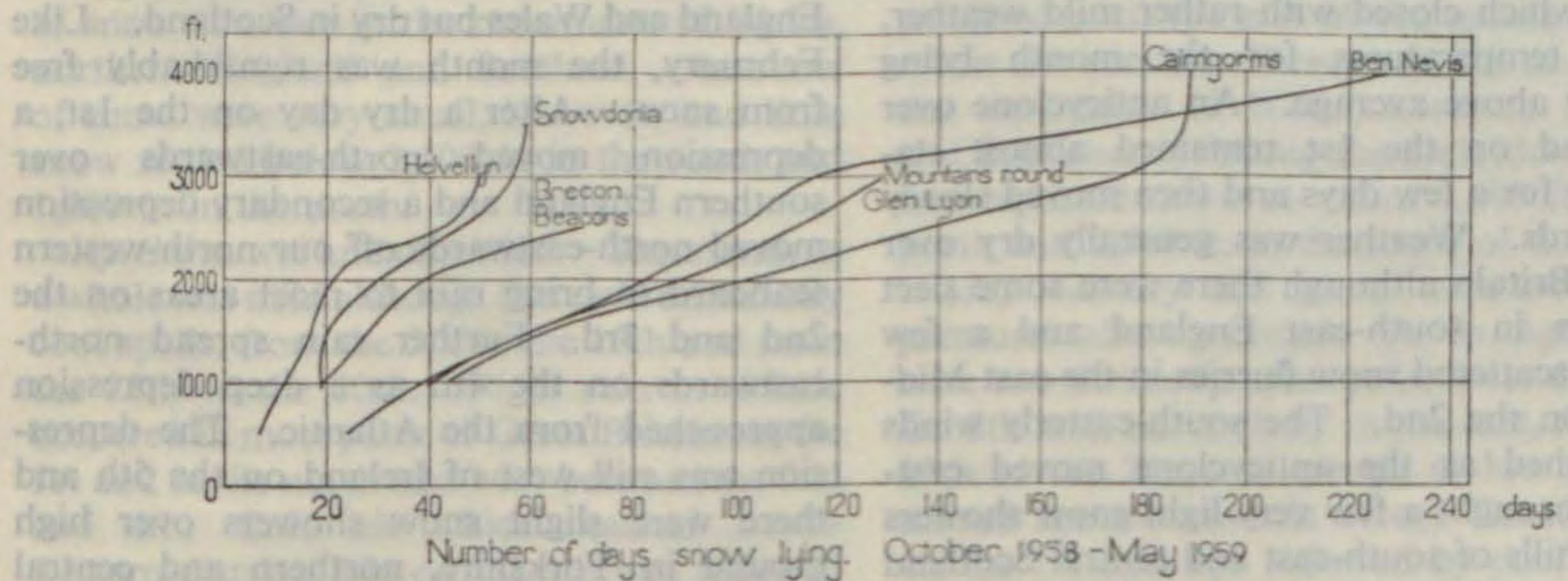


Fig 2. SEASONAL DURATION OF SNOW COVER.



500 ft. in Banffshire, Ross and Cromarty, and drifts of 2 ft. with level falls of 12 in. at about the same elevation in Nairn. Snow showers continued over Scotland and north-east England between the 24th and 26th but the area affected gradually decreased by the 27th and on the 28th showers were mainly confined to the hills of north-east Scotland. A frontal trough moving south-eastwards across the British Isles on the 29th and 30th was preceded by snow at higher levels in parts of Inverness-shire and Peeblesshire. However, amounts of snow were very small. The month closed with an anticyclone over Scotland and dry weather in all areas. Although snow was still lying above about 1,500 ft. in the mountains of Scotland and parts of north Wales, other areas were free of snow after a month in which many places experienced an unusually persistent snow cover. For example, near sea-level in Ross and Cromarty snow lay throughout the month, and near the Northumberland coast there was a continuous snow cover from the 1st to 18th and again from the 22nd to 28th. In Lancashire, at 600 ft., snow lay for 22 days, from the 3rd to 18th and the 24th to 29th. Even in the Hebrides where, near sea-level, there is an average of one day in January with snow cover, snow lay from the 5th to 16th, while over Dartmoor, ground above 1,000 ft. was snow covered from the 8th to 17th.

*February* was exceptionally dry, with rainfall and snowfall well below average. The cold weather of January continued into February which closed with rather mild weather, mean temperatures for the month being slightly above average. An anticyclone over Scotland on the 1st remained almost stationary for a few days and then moved slowly eastwards. Weather was generally dry over Great Britain although there were some sleet showers in south-east England and a few widely scattered snow flurries in the east Midlands on the 2nd. The south-easterly winds established as the anticyclone moved eastwards brought a few very light snow showers to the hills of south-east and central Scotland

on the 5th. Otherwise weather was dry and cold in most areas until the 9th. A weakening occlusion brought rain to western districts on the 9th and some slight rain or drizzle to central and eastern districts on the 10th with some very light intermittent snow in Stirlingshire and Perthshire. South to south-east winds persisted over the country until the 13th, with dull dry weather. A cold front, moving south-eastwards across Scotland into central districts of England and Wales followed by a wave depression moving quickly north-eastwards off our north-west seaboard, brought rain to many districts between the 14th and 16th. A major wave depression retarded the south-eastward movement of the cold front over the remainder of Great Britain, but all areas were in the cold air by late on the 20th. There were snow showers in Scotland between the 19th and 21st, mainly in Orkney, Shetland and the northern and eastern counties of the mainland. Snow settled down to about 500 ft. No heavy falls were reported and even at 1,000 ft. snow depths did not exceed 2 in. Milder south-westerly winds spread across all areas on the 22nd and persisted until the end of the month. Much of the January snow still lying at higher levels gradually dispersed with the onset of the milder weather, and by the end of the month there was very little snow lying in the mountains of England and Wales, and in the north of Scotland the snow line had receded to around 3,000 ft.

*March* was generally mild, rather wet in England and Wales but dry in Scotland. Like February, the month was remarkably free from snow. After a dry day on the 1st, a depression moved north-eastwards over southern England and a secondary depression moved north-eastwards off our north-western seaboard to bring rain to most areas on the 2nd and 3rd. Further rain spread north-eastwards on the 4th as a deep depression approached from the Atlantic. The depression was still west of Ireland on the 5th and there were slight snow showers over high ground in Yorkshire, northern and central



Scotland. Cold northerly winds were established over Great Britain on the 6th and 7th as the depression moved eastwards into the North Sea and brought snow showers to the Scottish mountains. A little snow settled above 1,500 ft. Very slight snow showers continued in the mountains of south and central Scotland on the 8th and 9th and were also reported at elevations above 1,000 ft. in the North Riding and Northumberland. A complex trough of low pressure moved slowly eastwards over the country on the 10th and 11th and was followed by a cold unstable, westerly airstream which brought slight snow showers to the mountain tops of north Wales, the Lake District, south and central Scotland. Further troughs moved slowly across the country between the 13th and 15th and there were very slight snow showers above about 1,500 ft. in the mountains of north and central Scotland and north-west England. An anti-cyclone developed in the cold air over the British Isles on the 16th and moved eastwards into central Europe on the 18th. The resulting cold easterly winds brought sleet and snow showers to central and eastern districts of England on the 18th and 19th, but no snow settled. After dry weather on the 20th rain reached the south-west late on the 21st and subsequently spread north-eastwards to affect all areas. A further rain belt moved across the country on the 24th and 25th and from then until the end of the month periods of rain alternated with brighter weather and scattered showers, mainly in the north. Showers were of snow at times in the mountains of Wales, northern England and Scotland. Amounts of snow were very small, however, and little snow settled below 2,500 ft. in the south and 1,000 ft. in the north.

*April* was wet and unsettled. The month as a whole was mild although there were distinctly cool spells, from the 5th to the 10th and from the 25th to the 30th. Slight rain or drizzle occurred in most parts of Great Britain on the 1st and in the north and west between the 2nd and 4th. Cold air which reached north-western districts late on the 4th was followed

by colder air on the 6th, cold showery weather persisting until the 10th. There were snow showers over the mountains of Scotland, north-west England and north Wales, with a few widely scattered snow showers in the Midlands on the 7th and 8th. In north Wales a little snow settled for a few hours on ground above 1,500 ft. In northern Scotland snow settled at 500 ft., but again, only for a few hours at this level. A number of places in the Scottish hills and mountains had snow showers on six successive days. Even so, while snow depths over ground below 1,500 ft. were negligible, falls accumulated at higher levels and snow lay to a depth of 12 in. in the Cairngorms, with drifts to 3 ft. Winds backed towards the south-west on the 12th and weather, although remaining unsettled, was warmer until the 15th, when winds backed to south-east as a depression moved in from the Atlantic towards France. The depression moved into central Europe by the 17th with cooler northerly winds blowing over the British Isles. Slight snow showers over the mountains of Scotland and hills of north-east England died out on the 19th as a weakening frontal system approached from the Atlantic and brought some rain to the west and north. After a few days' fine warm weather there was rain in most areas between the 24th and 26th as a trough moved eastwards over the country and a secondary depression moved north-eastwards over Ireland and Scotland. Showery weather developed in the unstable air in the circulation of this depression and persisted until the end of the month. Some of the showers were heavy and fell as snow in the mountains of Wales, northern England and Scotland, including the Hebrides. Snow was reported down to about 1,000 ft. in the north and 2,500 ft. in the south of this area.

*May* was dry and sunny with mean temperatures above normal. As in April there were two distinctly cool spells, from the 1st to the 5th and, particularly in the east, from the 19th to the 21st. A trough of low pressure moved south-eastwards across Great Britain on the 1st and was followed by cool west to



north-west winds for a few days, with showers in most districts and a period of more continuous rain in the south-west on the 3rd. There were snow showers over the mountains as far south as the Lake District, but there were no heavy falls and snow in the south did not settle below 3,000 ft. and then only for a few hours. In the north a little snow lay for a few hours at 1,000 ft. and persisted for 4 or 5 days at 2,000 ft. and above. By the 5th showers were confined to Scotland where by the 6th, with the advection of warm air from the west, showers had died out and there was a little drizzle. Warmer weather followed in all areas, with local thunderstorms, mainly in the west, between the 7th and 13th. From then until the 18th weather was generally fine and dry although on the 16th it was rather cool and cloudy in eastern districts. Freshening north-easterly winds on the 18th gave isolated snow showers over the mountains of eastern Scotland and a little snow settled above 3,000 ft. This was the last snow of the month but the month closed with snow still lying at 4,000 ft. on Ben Nevis and with large patches 3 ft. to 4 ft. deep at the same height in the Cairngorms. A later report from the latter area indicated that after a light snow shower on 1st June the old snow soon disappeared and there was not sufficient snow anywhere for ski-ing. This was unusual; in the previous year ski-ing was possible until 7th July.

#### *Duration of snow cover on the British mountains*

Diagrams showing the distribution of snow cover relative to height for 11 areas in the British mountains are given in Fig. 1. They are based very largely upon the reports received from the relevant stations given in Table 1, in which the heights quoted for the various mountain ranges are those of the highest peaks visible from the observing stations. On a small number of occasions it was found necessary to supplement these reports with those from other stations in the same area, although it has not been possible to include the names of these additional stations in the table.

#### *Summary of 1959-60 Season*

The season as a whole was mild, mean temperatures over the nine months September 1959 to May 1960 showing an accumulated excess of about 7°C. (13°F.), both in England and Wales and in Scotland. February and March were the only months with below average temperatures in England and Wales and then the deficits were small, the means for both months being within 3°C. (5°F.) of the average. In Scotland mean temperature for January, as well as for February and March, was below the average, but February was the only really cold month with a temperature deficit of about 2°C. (4°F.). The total precipitation for the season—rainfall plus rainfall equivalent of melted snow and hail—showed an excess in England and Wales and a deficit in Scotland, but in neither case was the difference from average more than 5 per cent.

Data for ten\* representative stations in Great Britain at altitudes between 400 and 1,200 ft., which have been used for seasonal comparisons since the Survey of 1946-47, give for the 1959-60 season a mean of 23 days with snow lying at the morning observation. This is the same as the previous season and 9 days less than the average for the 13 seasons 1946-47 to 1958-59. During the first four months of this season there was less snow than usual in most areas, December being almost free of snow, although snowfall was more frequent and persisted longer than usual during January and February. Much of the snow lying was cleared by the abnormally mild weather in late February and early March; subsequent snowfall was generally below average.

At altitudes of about 1,000 ft. snow fell on more than 50 days in the Cairngorms and Moorfoot Hills, on more than 40 days in the north-west Highlands, the Lowther Hills, the northern Pennines and the Lake District, and on more than 30 days at Lake Vyrnwy and the Cambrian Mountains, while stations at slightly lower levels, the Yorkshire Wolds, the Cotswolds and the Chiltern Hills had snow on



20 days or more. At heights from sea level to about 300 ft., 40 days snowfall occurred in the Orkneys and Shetlands and along parts of the northern coast of the Scottish mainland, 20 days or more were reported from the Outer Hebrides, the coastal areas of Aberdeenshire and Kincardineshire, the Lincoln Marsh and inland in northern East Anglia. Ten days with snow falling was recorded at Guernesey (twice the average number) which was one more day than in most parts of Anglesey and the London area.

The seasonal duration of snow cover in the mountainous regions of Great Britain is summarized in Table 1 and illustrated for a selected number of regions in Fig. 2. At lower levels there were 20 to 30 mornings with snow cover in the Shetlands, in coastal areas of Caithness, the southern coast of the Moray Firth, over most of the N. Yorkshire Moors and in small areas around Birmingham and Church Stretton. Ground was snow covered on 10 to 20 mornings in the Hebrides, the western slopes of the mountain ranges from the north-west Highlands to the Peak District, over much of the Cambrian Range, over Lincolnshire and Norfolk, the hills of the Midlands, Wiltshire and Berkshire, the North and South Downs and over Dartmoor. There were less than 10 mornings with snow cover in western coastal districts, along much of the eastern coast of England and over most of southern England excluding the higher ground. Small sections of the south coast of England to the west of St. Albans Head, and most of the Cornish Coast did not report a single morning with snow cover.

The winter, judged by the number of mornings with snow lying around 9 a.m., was of less than average severity for Great Britain as a whole, but, nevertheless, certain restricted areas had more snow cover than usual. Coastal areas of the Outer Hebrides had two or three times the usual number of mornings; other widely separated areas with more than average snow cover included the Orkneys and Shetlands and the south coast of England east of Hayling Island.

### *Notes on the months*

*September* was predominantly anticyclonic, except for a day or two around the 20th. The month was notable for high day temperatures, abundant sunshine, very low rainfall and the absence of snow; snow, however, was often reported towards the end of the month in mountainous northern regions.

A warm southerly airstream covered Great Britain for most of the first half of *October*. A vigorous depression moving from the Scillies to the Wash on the night of the 17th/18th brought rain and the first snow of the season to the higher ground. On the morning of the 18th there were light coverings down to 3,000 ft. on Ben Nevis and the peaks of the Cairngorms. The depression was followed by strong westerly winds in all areas which carried troughs quickly eastwards across the country; on the morning of the 19th ground was snow covered down to 3,000 ft. in Perthshire and down to 2,000 ft. in Merionethshire, and between the 24th and 28th further light snow showers fell in Scotland and in the Welsh mountains. In the north there was snow down to sea level, but none was reported in southern Scotland below 500 ft. Although falls were generally light there was some drifting in the strong northerly winds which followed the passage of a vigorous depression across northern Scotland on the night of the 26th/27th. These winds, however, were replaced the following day by milder westerlies which completely cleared the snow, even from the higher peaks.

*November* weather was generally cyclonic in character. A series of troughs, associated with depressions to the north of Scotland, moved eastwards across all districts during the first week. Light snow showers fell in the Orkneys and northern counties of Scotland around the 3rd, but little settled on ground below 3,000 ft. "The snow line" soon retreated to 4,000 ft., and at this height Ben Nevis remained snow covered for the remainder of the season. On the 8th and 9th a period of heavy rain and strong winds, associated with a depression moving



eastwards near Iceland, was followed by cold westerly winds. The rain turned to snow over most of the high ground in Scotland, and snow showers soon followed in other areas. Between the 9th and 13th much of southern England was affected; Dartmoor had its first snow of the season on the 11th, which settled for a few hours at heights above 1,500 ft. Further north, there was snow cover, in places, lasting for two or three days, at altitudes of about 1,000 ft. in Central Wales, at about 500 ft. in the Pennines and Southern Uplands and near sea level in northern Scotland. Most stations between 500 and 1,000 ft. reported falls of up to 3 in., but there were heavy falls locally, particularly in the Peak District and Yorkshire Pennines. On the 10th a level fall of 15 in. was reported at Saddleworth Moor, while a number of roads in Derbyshire, including the Glossop-Sheffield road at Snake Pass, were blocked. Drifts 15 ft. deep were reported in the hills of Angus. A depression moved north from the Bay of Biscay on the 17th bringing rain to southern England. As the rain spread northwards it was preceded by slight snow on the 18th over the Yorkshire Wolds and in places over the mountains of eastern Scotland, and ground above 1,500 ft. became snow covered for a few hours. A complex depression gave occasional rain or showers over most of the country on the 28th and 29th. The showers were of snow at the highest levels of Snowdonia, where ground was lightly covered on the 27th, and again on the 30th; on the latter date fresh snowfalls occurred at a number of places in eastern Scotland, Northumberland and Durham, but it did not settle below 1,500 ft.

During the first four days of *December* a series of depressions and vigorous troughs moved north or north-east across the British Isles, accompanied by rain belts which were preceded by slight snow over high ground in Scotland and northern England. There were snow showers over higher ground in Scotland between the 3rd and the 5th, but falls were generally slight and little snow settled below 700 ft. However, parts of Stirlingshire had

as much as 4 in. at about this altitude on the 4th. An Atlantic depression deepened moving quickly to the Bay of Biscay on the 6th and then more slowly to the Irish Sea. Another depression followed a similar track some three days later and east to south-east winds were maintained over the British Isles until the 13th. Temperatures fell progressively, but remained high enough to limit snowfall mostly to the mountains of eastern Scotland and northern England; there were scattered snow showers in Snowdonia on the 10th. Weather was generally very unsettled during the second half of December, major depressions approaching the country from the Atlantic on the 17th, 23rd, 26th and 29th; all became slow-moving and filled up in the vicinity of northern Scotland. A breakthrough of colder air on the 18th brought snow showers to the higher ground in Scotland; a little snow settled but none below 1,000 ft. On the 23rd a few snow showers fell as far south as Exmoor. Further snow showers occurred in Scotland and northern England in outbreaks of polar air on the 26th and 29th, but, as previously, the showers were mainly slight and confined to the higher ground. Fig. 2 shows that snow did not lie for long except at the highest altitudes in the north.

In terms of the number of mornings with snow lying, December's snow was considerably below average. Most observers in Wales co-operating in this Survey, and those in England south of  $54^{\circ}\text{N}$ , went through the month without reporting snow lying at a single morning observation, while those further north, who would normally at this time of year be expected to report snow lying on about 10 mornings, in most cases had less than two such occasions to report.

In *January* troughs of low pressure moved quickly north-east and later south-east across the country during the first five days. On the 5th an anticyclone developed to the south-west of Iceland and cold west to north-west winds spread to all districts, bringing snow showers to the Southern Uplands and the Cheviots. The anticyclone moved north-east



Table 1.—Number of days with snow lying in the British mountains

(a) near summit;  
 (b) at about 2,500 ft.;  
 (c) at station level.

		Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Season
Clisham and Roneval (2,622 ft.)	a	0	5	2	14	18	4	1	0	44
Station: Leverburgh, Harris (25 ft.)	b									
Inverness-shire	c		0	0	3	10	0	1	0	14
Mountains round Glen Lyon (3,407 ft.)	a	6	15	31	31	28	31	9	0	151
Station: Meggernie Castle (760 ft.)	b	5	13	31	29	28	19	5	0	130
Perthshire	c	0	3	1	9	16	1	0	0	30
Cairngorms (4,296 ft.)	a	9	16	29	27	27	24	22	14	168
Station: Achnagoichan (1,000 ft.)	b	6	9	29	27	27	23	10	1	132
Inverness-shire	c	0	1	1	10	17	2	0	0	31
Ben Nevis (4,406 ft.)	a	9	28	31	31	29	31	30	31	220
Station: Corpach (30 ft.)	b	3	21	31	31	29	31	24	0	170
Inverness-shire	c	0	2	1	4	17	0	0	0	24
Ben More (3,170 ft.)	a	0	12	0	11	24	1	0	0	48
Station: Rhuvaal (42 ft.)	b	0	12	0	11	24	1	0	0	48
Argyllshire	c	0	0	0	0	6	0	0	0	6
Snowdonia (3,560 ft.)	a	2	2	25	21	29	14	5	0	117
Station: Capel Curig (640 ft.)	b	1	7	4	8	20	2	0	0	42
Caernarvonshire	c	0	0	0	3	2	0	0	0	5
South Snowdonia (2,527 ft.)	a	1	4	3	8	14	1	0	0	31
Station: Llanfrothen (475 ft.)	b	1	4	3	8	14	1	0	0	31
Merionethshire	c	0	0	0	1	6	0	0	0	7
Brecon Beacons (2,906 ft.)	a	3	4	9	22	19	31	2	0	90
Station: Tairbull (660 ft.)	b	3	4	9	22	19	31	2	0	90
Brecknockshire	c	0	0	0	1	4	0	0	0	5
Cross Fell (2,893 ft.)	a	1	5	8	15	18	31	1	0	79
Station: Alston (1,070 ft.)	b	1	5	8	15	18	31	0	0	78
Cumberland	c	0	4	0	11	11	1	0	0	27
Helvellyn (3,118 ft.)	a	0	7	11	13	15	2	0	0	48
Station: Patterdale (520 ft.)	b	0	7	7	13	15	2	0	0	44
Westmorland	c	0	0	0	2	2	0	0	0	14
Skells Range (2,668 ft.)	a	0	6	3	13	16	2	1	0	41
Station: Dalry (Forrest Lodge) (500 ft.)	b									
Kirkcudbrightshire	c		2	1	6	14	1	0	0	24

becoming centred over Scandinavia by the 9th. Cold easterly winds brought snow showers over a wide area from Perthshire in the north to Somerset in the south. Winds remained between east and north for a day or two and showers became heavier and more general over England and the south-eastern counties of Wales on the 10th and 11th, snow accumulating to a depth of 5 to 6 in. in Kent

and Sussex. A depression moving southwards from Scotland to the English Channel brought a period of continuous snow to central and southern districts on the 12th and 13th. On the morning of the 14th most of the country was snow covered, snowfalls at low levels ranging up to 4 in. There were further snow showers during the next day or two, except in the extreme west, while troughs



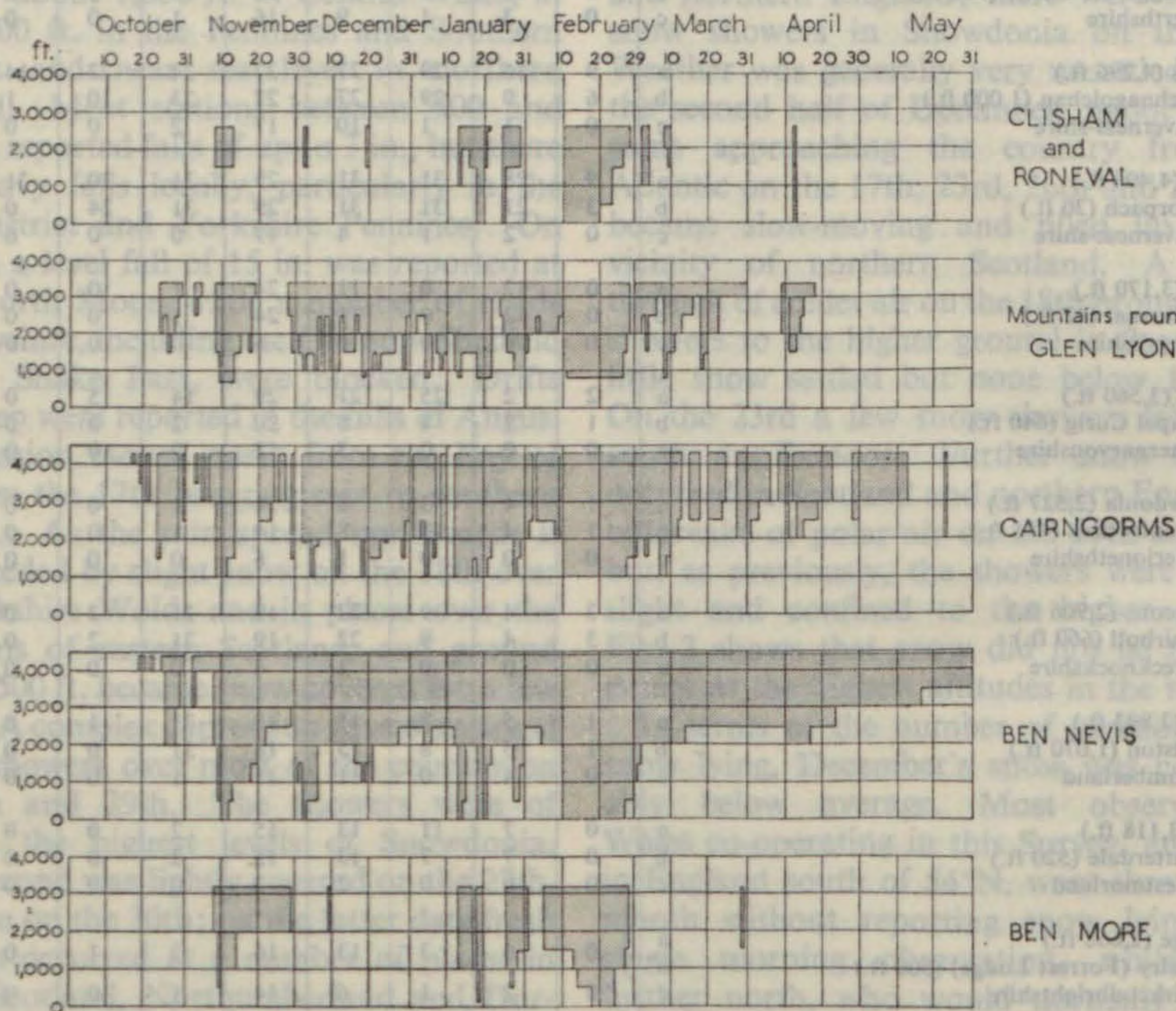


Fig. 1.—continued on next page.



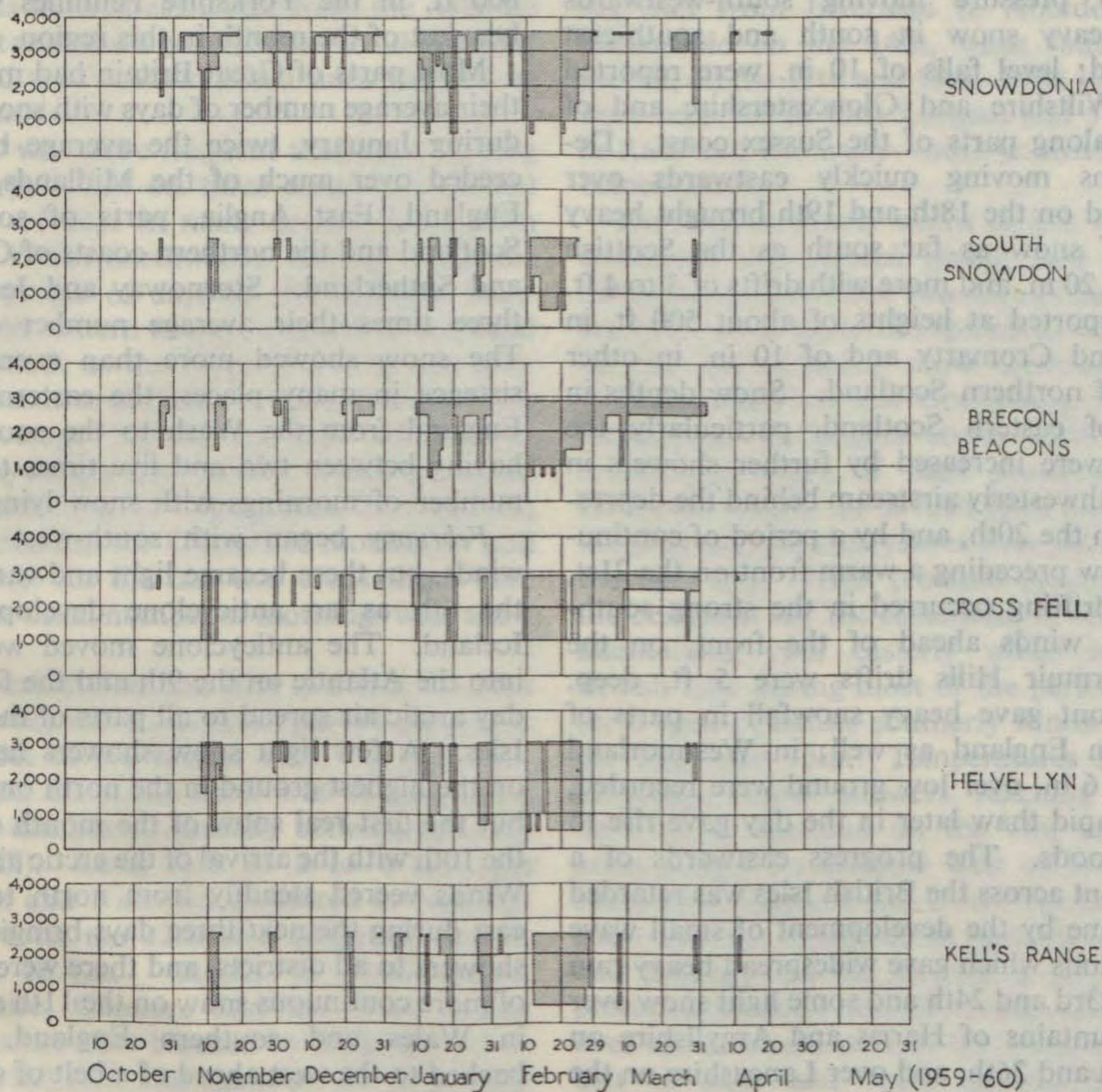


Fig 1. DISTRIBUTION OF SNOW COVER IN RELATION TO HEIGHT

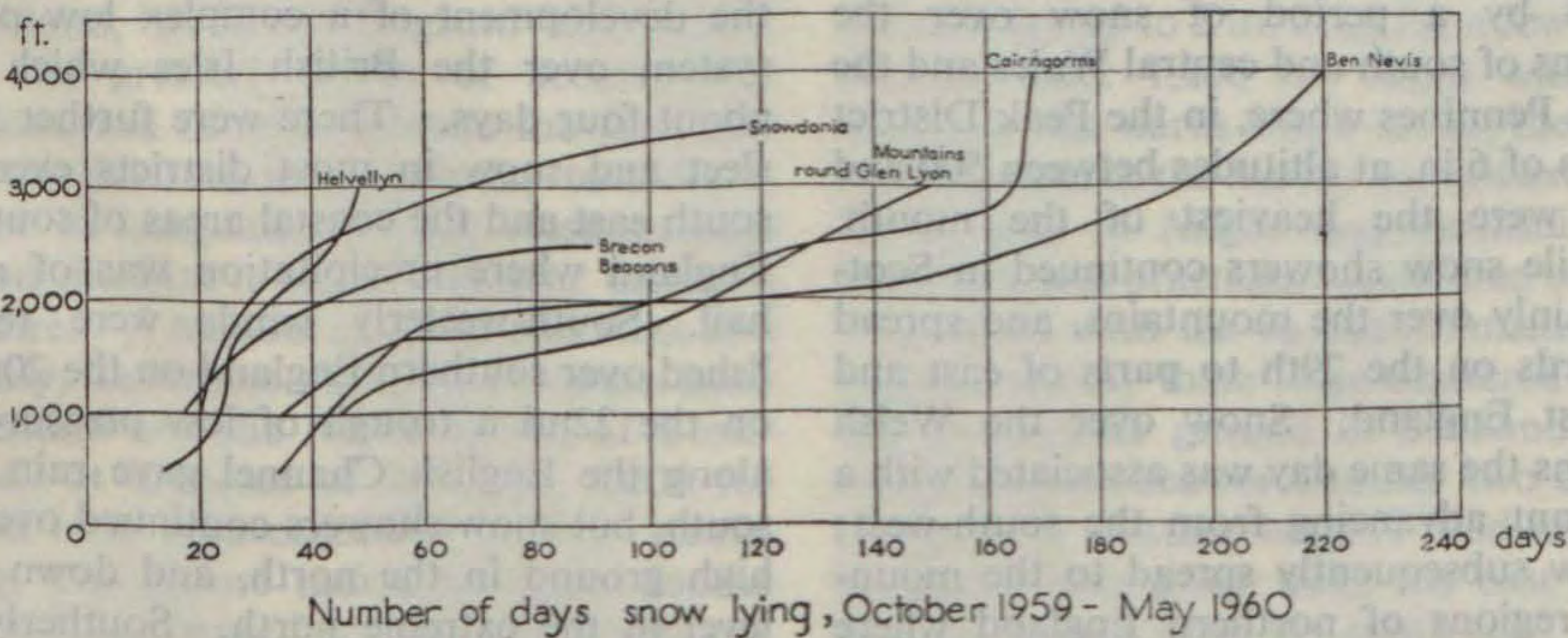


Fig 2. SEASONAL DURATION OF SNOW COVER



of low pressure moving south-westwards gave heavy snow in south and south-east England; level falls of 10 in. were reported from Wiltshire and Gloucestershire and of 12 in. along parts of the Sussex coast. Depressions moving quickly eastwards over Scotland on the 18th and 19th brought heavy falls of snow as far south as the Scottish border, 20 in. and more with drifts of 3 to 4 ft. were reported at heights of about 500 ft. in Ross and Cromarty and of 10 in. in other parts of northern Scotland. Snow depths in parts of eastern Scotland, particularly the south, were increased by further showers in the northwesterly airstream behind the depressions on the 20th, and by a period of continuous snow preceding a warm front on the 21st, heavy drifting occurred in the strong southeasterly winds ahead of the front, on the Lamermuir Hills drifts were 5 ft. deep. This front gave heavy snowfall in parts of northern England as well; in Westmorland falls of 6 in. over low ground were recorded, but a rapid thaw later in the day gave rise to local floods. The progress eastwards of a cold front across the British Isles was retarded for a time by the development of small wave depressions which gave widespread heavy rain on the 23rd and 24th and some light snow over the mountains of Harris and Argyllshire on the 25th and 26th, and over Lancashire on the 27th. On the 27th, too, a warm front moving north-eastwards from the Bay of Biscay, gave prolonged rain over a wide area, which was preceded by a period of snow over the mountains of south and central Wales and the southern Pennines where, in the Peak District level falls of 6 in. at altitudes between 500 and 800 ft. were the heaviest of the month. Meanwhile snow showers continued in Scotland, mainly over the mountains, and spread southwards on the 29th to parts of east and north-east England. Snow over the Welsh mountains the same day was associated with a warm front advancing from the south-west; this snow subsequently spread to the mountainous regions of northern England where falls of 7 to 8 inches at heights of around

800 ft. in the Yorkshire Pennines were the heaviest of the month in this region.

Most parts of Great Britain had more than their average number of days with snow falling during January, twice the average being exceeded over much of the Midlands, eastern England, East Anglia, parts of south-west Scotland and the northern coasts of Caithness and Sutherland. Stornoway and Jersey had three times their average number of days. The snow showed more than average persistence in many places, the eastern half of England from the Wash to the south coast having between two and five times the usual number of mornings with snow lying.

*February* began with south-west to west winds, but these became light and variable on the 6th as an anticyclone developed over Iceland. The anticyclone moved westwards into the Atlantic on the 9th and the following day arctic air spread to all parts of the British Isles. A few light snow showers had fallen on the highest ground in the north on the 4th, but the first real snow of the month came on the 10th with the arrival of the arctic airstream. Winds veered steadily from north to north-east during the next three days bringing snow showers to all districts, and there were periods of more continuous snow on the 11th and 12th in Wales and southern England. Winds backed to the west ahead of a belt of sleet and snow on the 14th and the next day the movement of a depression off north-east Scotland south-westwards over the country, marked the development of a complex low pressure system over the British Isles which lasted about four days. There were further falls of sleet and snow in most districts except the south east and the coastal areas of south-west England where precipitation was of rain or hail. South-westerly winds were re-established over southern England on the 20th, and on the 22nd a trough of low pressure lying along the English Channel gave rain in the south, but snow showers continued over most high ground in the north, and down to sea level in the extreme north. Southerly gales developed on the 24th, and a complex series



of fronts moving eastwards from the Atlantic brought rain and a general thaw to all districts; the mild wet weather lasted until the end of the month.

Snow was more frequent than usual during February, it fell on three times the normal number of days in many coastal areas from central Wales northwards, and on twice the usual number of days in the Orkneys, Shetlands and eastern coastal districts of Scotland as far south as the Firth of Forth. In contrast, coastal areas in Kent had rather less than their average number of days with snow. Snow lay longer than usual in widely dispersed areas, including the Cairngorms, the Pennines, the Midlands, the Cambrian mountains and Dartmoor—in the last two areas there were twice the usual number of mornings with snow lying.

The period from the 10th to about the 20th of February was the severest part of the winter over most of the British Isles. In the Midlands and the south snow was at its deepest early in this period (usually between the 11th and 15th). Level falls of 2 to 4 in. were common and 7 in. was measured in Nottinghamshire on the 12th at a height of 565 ft. above M.S.L. Roads in Staffordshire, Derbyshire, Cheshire and the West Riding of Yorkshire were blocked by drifts up to 7 ft. deep on the 11th and again on the 14th. On Exmoor snow accumulated to a maximum depth rather later; at Dunkery Beacon 10 to 14 in. of level snow was measured on the 17th. In Scotland, northern England and North Wales the greatest depths of accumulated snow occurred usually between the 18th and 21st. On the 19th level snow lay to a depth of 21 in. at Langdale (400 ft.), Westmorland, while on the 21st it lay to a similar depth in Banffshire. A number of stations in Ross and Cromarty, Inverness-shire, Northumberland, Cumberland and the North Riding of Yorkshire, all at altitudes of less than 1,000 ft., reported level falls exceeding 12 in. Heavy drifting, well before maximum snow depths were attained, caused serious traffic dislocation. Many main roads in Scotland, includ-

ing that from Inverness to Aberdeen were impassable on the 14th, while later in the month, on the 17th and 18th, drifts 10 ft. deep were reported in East Lothian and 5 ft. deep in Ross and Cromarty—both at altitudes well below 800 ft.

The mild southerly winds of late February continued into *March* giving rain in most districts during the first two days of the month, but cold north-westerlies spread to most areas on the 3rd bringing snow showers to the western Highlands and Grampians, but snow settled only at heights above 1,500 ft. An intensifying ridge of high pressure moved eastwards across the British Isles on the 4th, merging with an anticyclone over Scandinavia the next day. High pressure persisted over the continent for the remainder of the month maintaining cool easterly winds over the British Isles during most of the period except for a spell of milder southerly winds between the 10th and 15th. Temperatures fell progressively, snow showers reaching eastern districts of Scotland on the 7th, and most areas except the extreme west of Wales and south-west England the following day. The snow showers continued in northern England and Scotland on the 9th but a belt of rain preceded by snow moved slowly northwards over the southern part of the country. This belt of rain and snow crossed northern districts on the 10th. Snowfall from 7th to 10th was quite small in amount in southern England except over Dartmoor and Exmoor where it lay up to 2 in. deep for a few hours at altitudes over 1,200 ft. Snow was a little heavier in the north but, even so, the heaviest falls reported to the Survey did not exceed 3 in. These were in Angus and Perthshire. The next week was practically snow-free but on the 17th when, with the re-establishment of cold easterly winds, there were scattered showers over the higher ground in Scotland. These showers continued for another two days, but on the 20th weather became mild and sunny in most places away from the east coast as drier air spread from the south-east. On the 26th, however, winds again backed towards



the north-east with an appreciable fall of temperature and snow showers returned to the north Midlands and to most parts of northern England and south-east Scotland. Although the showers continued until the end of the month, very little snow settled below 1,000 ft., and even at greater altitudes any cover was short-lived. On the night of the 28th/29th a belt of heavy rain was preceded by snow over Dartmoor and Exmoor where for a time ground above 1,000 ft. was covered to a depth of 4 in.

The number of days with snow falling was below average in most parts of Great Britain during March, eastern and southern coastal areas in particular having rather less than half the usual number of days. The number of days with snow lying was also well below the average, large areas of south-east England, the east Midlands and north-west Scotland not reporting one morning with snow lying during the month. The north-west Highlands and the Grampians had less than half the normal number of days.

Winds were mainly south-westerly during the first half of April, but north-westerly on the 10th and 11th and again on the 13th and 14th in the rear of depressions moving across the British Isles. These winds brought slight snow showers to the mountains of Scotland, northern England and north Wales on the 10th and 11th and sleet as far south as the Cotswolds and Mendips. Further snow showers were reported between the 13th and 15th mainly over the Scottish mountains and the western slopes of the Pennines. Winds became light and variable on the 15th as pressure rose over Ireland and a belt of high pressure became established from the Azores to Scandinavia. On the 20th pressure fell over Scandinavia and an anticyclone became centred over the British Isles until the end of the month. There was little snow during the second half of the month although rain belts moving across Scotland on the 20th and 29th were preceded by light snow over the highest ground.

Snow fell on rather less than the average

number of days during April except in the Shetlands where the number of days with snow was about average. At most stations snow did not lay more than a few hours.

May opened with an anticyclone to the north-west of Scotland; associated north-easterly winds brought snow showers to the mountains of Scotland in the north and east, thin coverings of snow persisting for a few hours at altitudes above 1,000 ft. Sleet and snow showers were also reported from the Shetlands. Snowfall during the month was limited to two days, the second occasion being on the 24th during a spell of unsettled weather where there were slight showers on ground above 1,500 ft. in Ross-shire, Inverness-shire and Argyllshire. At the end of the month snow cover still persisted above 3,500 ft. on Ben Nevis and there were still patches on the north facing slopes of the Cairngorms.

Isolated reports from the Cairngorms told of pockets of snow in sheltered areas between 3,200 ft. and 3,800 ft. towards the end of June and a fresh fall in the mountains on June 30th brought light general cover down to 3,900 ft.

Snow patches at heights above 4,000 ft. persisted until the end of July.

#### *Duration of snow cover on British mountains*

Diagrams showing the distribution of snow cover relative to height for 11 areas in the British mountains are given in Fig. 1. They are based very largely upon reports received from the relevant stations given in Table 1, in which the heights are quoted for the various mountain ranges are those of the highest peaks visible from the observing stations. On a small number of occasions it was found necessary to supplement these reports with those from other stations in the same area, although it has not been possible to include the names of these additional stations in the table.

\* These stations are Dalwhinnie, Braemar, Penicuik, Eskdalemuir, Huddersfield (Oakes), Buxton, Dunstable, Little Rissington, Princetown and Llandrindod Wells. Penicuik, Dunstable and Llandrindod Wells are replacements for West Linton, Whipsnade and Rhayader respectively, the three stations used until season 1954-55.