

NORWAY (*Norge*), a kingdom of northern Europe, occupying the W. and smaller part of the Scandinavian peninsula. Its E. frontier marches with that of Sweden, except in the extreme N., where Norway is bounded by Russian territory. On the N., W., S. and S.E. the boundary is the sea—the Arctic Ocean, that part of the Atlantic which is called the Norwegian Sea, the North Sea and the Skagerrack successively. The S. extremity of the country is the island of Slettingen in $57^{\circ} 58' N.$, and the N. that of Knivskjærødden, off the North Cape in $71^{\circ} 11' N.$ Of the mainland, the southernmost promontory is Lindesnæs, in $57^{\circ} 59' N.$, while the northernmost is Nordkyn, in $71^{\circ} 7' N.$ The S. of the country, that is to say, the projection between the Skagerrack and the North Sea proper, lies in the same latitude as the N. of Scotland and Labrador, and the midland of Kamchatka. The most western island, Utvær, lies off the mouth of the Sogne Fjord ($4^{\circ} 30' E.$), and the easternmost point of the country is within the Arctic lands, near Vardö ($31^{\circ} 11' E.$). The direct length of Norway (S.W. to N.E.) is about 1100 m. The extreme breadth in the S. (about $61^{\circ} N.$) is 270 m., but in the N. it is much less—about 60 m. on the average, though the Swedish frontier approaches within 6 m. of a head-branch of Ofoten Fjord, and the Russian within 19 m. of Lyngen Fjord. The length of the coast line is difficult to estimate; measured as an unbroken line it is nearly 1700 m., but including the fjords and greater islands it is set down as 12,000. The area is estimated at 124,495 sq. m.

Physical Features. Relief.—The main mountain system of the Scandinavian peninsula hardly deserves its name of Kjolen¹ (the keel). It may rather be described as a plateau deprived of the appearance of a plateau, being on the one hand grooved by deep valleys, while on the other many salient peaks tower above its average level. Such peaks, during the later Glacial period, stood above the ice-field. Peaks and ridges were formed by the action of small glaciers cutting out each its circular hollow (*botn*) just as they still work on the remaining snow-fields. But where the power of the main ice-mass was at work, the characteristic rounded forms of base rock are seen, close above the sea along the coast, but even as high as 5000 ft. in some inland localities. The high plateau lies along the W. side of the peninsula, so that except in the S.E. Norway is mountainous throughout. Even the part excepted is hilly, but it partakes of the character of the long eastern or Swedish slope of the peninsula. Beyond the coast line their floors sink far below sea-level, and thus are formed the fjords and the belt of rugged islands which characterize almost the entire seaboard of Norway. Where Norway marches with Russia, a few heights exceed 3000 or even 4000 ft., but the land is not generally of great elevation. But from the point of junction with Swedish territory the mountains increase considerably in height. For a short distance, as far south as Lake Torne, the loftiest points lie within Norwegian territory, such as Jæggevarre (6283 ft.), between Lyngen and Ulfs fjords, and Kiste Fjeld (5653 ft.) farther inland. Thereafter the principal heights lie approximately along the crest-line of the plateau and within Swedish territory. Sulitelma, however (6158 ft.), lies on the frontier. Southward again the higher summits fall to Norway. S. of Bódö, Svartisen ("the black ice"), a magnificent snow-field bordering the coast, and feeding many glaciers, culminates at 5246 ft. Thereafter, Okstinderne or Oxtinderne (6273 ft.), and the Store Børge Fjeld (5587 ft.) are the principal elevations as far as $64^{\circ} N.$ A little S. of this latitude the so-called Trondhjem depression is well marked right across the central upland, the height of the mountains not often exceeding 4000 ft., while the peaked form characteristic of the heights which rose clear of the glaciers of the later Glacial period is wanting. It is from this point too that Norwegian territory broadens

¹ In Norwegian the definite article (when there is no epithet) is added as a suffix to the substantive (masc. and fem. *en*, neuter *et*). Geographical terms are similarly suffixed to names, thus *Suldalsvandet*, the lake Suldal. The commonest geographical terms are: *elv*, river; *vand*, lake; *fjeld*, mountain or highland; *ø*, island; *dal*, valley; *næs*, cape; *fos*, waterfall; *bræ*, glacier; *vik*, *vig*, bay; *eide*, isthmus; *fjord*. *Aa* is pronounced aw.

so as to include not only the highest land in the peninsula, but a considerable part of the general E. and S.E. slope. The high plateau broadens and follows the S.W. sweep of the coast. Pursuing it S. the Dovre Fjeld is marked off by the valleys of the rivers Driva and Sundal, Laagen (or Laugen) and Rauma, and the fjords of the coastland of Nordmøre. Here Snehætta reaches a height of 7615 ft., and the Romsdal (the name under which the Rauma valley is famous among tourists) is flanked by many abrupt jagged peaks up to 6000 ft. high. The valley of the Laagen forms the upper part of Gudbrandsdal. East of this and S.E. of the Dovre is another fjeld, Rondane, in which Högronden rises to 6929 ft. South of the Otta valley is Jotunheim or Jötun Fjeld, a sparsely peopled, in parts almost inaccessible, district, containing the highest mountains in Scandinavia, Galdhøpiggen reaching 8399 ft. On the seaward side of Jotunheim is Jostedalsbræ, a great snow-field in which Lodalskaupen reaches a height of 6795 ft. South of Sogne Fjord ($61^{\circ} N.$) mountains between 5000 and 6000 ft. are rare; but in Hallingskarvet there are points about 6500 ft. high, and in the Hardanger Vidde (waste), a broad wild upland E. of Hardanger Fjord, Haarteigen reaches 6063 ft. The highland finally sinks towards the S. extremity of Norway in broken masses and short ranges of hills, separated by valleys radiating S.E., S. and W.

Glaciers.—The largest glacier in continental Europe is Jostedalsbræ, with an area of 580 sq. m., the snow-cap descending to 4000 or 4500 ft. Several of its branches fall nearly to the sea, as the Bøiumsbræ above the Fjærland branch of Sogne Fjord. The largest branch is the Nigardsbræ. Skirting Hardanger Fjord, and nearly isolated by its main channel and two arms, is the great glacier of Folgefond (108 sq. m.). Two branches descending from the main mass are visited by many who penetrate the Hardanger—Buarbræ on the E., falling towards Lake Sandven above Odde, and Bondhusbræ on the W. The extreme elevation of the Folgefond is 5270 ft. Continuing N. other considerable snow-fields are those of Hallingskarvet, the Jotunheim, Snehætta in Dovre Fjeld, and Store Børge Fjeld at the head of the Namsen valley. Next follow Svartisen, second in extent to Jostedalsbræ (nearly 400 sq. m.), the Sulitelma snow-field and Jökul Fjeld, between Kvæng and Öxfjords. One glacier actually reaches the edge of Jökul Fjord, a branch of Kvæng Fjord, so that detached fragments of ice float away on the water. This is the only instance of the kind in Norway. The Seiland snow-field, on Seiland island near Hammerfest, is the most northerly *névé* in Europe. The snow-line in Norway is estimated at 3080 ft. in Seiland, 5150 ft. on Dovre Fjeld, and from 4100 to 4900 ft. in Jotunheim. The lowness of the snow-line adds to the grandeur of Norwegian mountains.

Coast.—The flanks of the plateau fall abruptly to the sea almost throughout the coast-line, and its isolated fragments appear in the innumerable islands which fringe the mainland. This island fringe, which has its counterpart in a modified form along the Swedish coast, is called in Norwegian the *skjærgaard* (skerry-fence, pronounced shårgeord). This fringe and the fjord-coast are most fully developed from Stavanger nearly as far as the North Cape. The channels within the islands are of incalculable value to coastwise navigation, which is the principal means of communication in Norway. The voyage northward from Stavanger may be made in quiet waters almost throughout. Only at rare intervals vessels must enter the open sea for a short distance, as off the port of Haugesund, or when rounding the promontory of the Stat or Statland, S. of Aalesund, passing the coast of Hustadviken, S. of Christiansund, or crossing the mouth of some large fjord. At some points large steamers, following the carefully marked channel, pass in deep water between rocks within a few yards on either hand. Small ships and boats, fishing or trading between the fjord-side villages, navigate the ramifying "leads" (*leder*) in security. In some narrow sounds, however, the tidal current is often exceedingly strong. The largest island of the skjærgaard is Hindö of the Lofoten and Vesteraalen group. Its area is 860 sq. m. The number of islands is estimated at 150,000 and their area at 8500 sq. m. Many of them are of

Skjærgaard or island-fence.

great elevation, especially the more northerly; thus the jagged peaks characteristic of Lofoten culminate at about 4000 ft. Hornelen, near the mouth of Nordfjord, 3000 ft. high, rises nearly sheer above the Frøjjord, and vessels pass close under the towering cliff. Torghatten ("the market hat"), N. of Namsos, is pierced through by a vast natural tunnel 400 ft. above the sea; and Hestmandö ("horseman island"), on the Arctic circle, is justly named from its form. The dark blue waters of the inner leads and fjords are clouded, and show a milky tinge on the surface imparted by the glacier-fed rivers. Bare rock is the dominant feature of the coast and islands, save where a few green fields surround a farmstead. In the N., where the snow-line sinks low, the scenery at all seasons has an Arctic character.

Christiania Fjord, opening from the N. angle of the Cattegat and Skagerrack, differs from the great fjords of the W. Its shores are neither so high nor so precipitous as theirs;

Fjords. it is shallower, and contains a great number of little islands. From its mouth, round Lindesnæs, and as far as the Bukken Fjord (Stavanger) there are many small fjords, while the skjærgaard provides an inner lead only intermittently. Immediately S. of Bukken Fjord, from a point N. of Egersund, the flat open coast of Jæderen, dangerous to shipping, fringing a narrow lowland abundant in peat-bogs for some 30 m., forms an unusual feature. Bukken Fjord is broad and island-studded, but throws off several inner arms, of which Lyse Fjord, near Stavanger, is remarkable for its extreme narrowness, and the steepness of its lofty shores. The Hardanger Fjord, penetrating the land for 114 m., is known to more visitors than any other owing to its southerly position; but its beauty is exceeded by that of Sogne Fjord and Nord Fjord farther N. Sogne is the largest and deepest fjord of all; its head is 136 m. from the sea, and its extreme depth approaches 700 fathoms. Stor Fjord opens inland from Aalesund, and one of its head branches, Geiranger Fjord, is among the most celebrated in Norway. Trondhjem Fjord, the next great fjord northward, which broadens inland from a narrow entrance, lacks grandeur, as the elevation of the land is reduced where the Trondhjem depression interrupts the average height of the plateau. The coast N. of Trondhjem, though far from losing its beauty, has not at first the grandeur of that to the south, nor are the fjords so extensive. The principal of these are Namsen, Folden and Vefsen, at the mouth of which is Alsten Island, with the mountains called Syv Søstre (Seven Sisters), and Ranen, not far S. of the Arctic circle. Svartisen sends its glaciers seaward, and the scenery increases in magnificence. Salten Fjord, to the N. of the great snow-field, is connected with Skjerstad Fjord by three narrow channels, where the water, at ebb and flow, forms powerful rapids. The scenery N. of Salten is unsurpassed. The Lofoten and Vesteraalen islands are separated from the mainland by the Vest Fjord, which is continued inland by Ofoten Fjord. If these two be considered as one fjord, its length is about 175 m., but the actual penetration of the mainland is little more than a fifth of this distance. The main fjords N. of Vesteraalen have a general northerly direction; among them is Lyngen Fjord near Tromsø, with high flanking cliffs and glaciers falling nearly to the sea. Alten Fjord is remarkable for the vegetation on its shores. From Lofoten N. there is a chain of larger islands, Senjen, Kvalö, Ringvadsö, Sorö, Stjernö, Seiland, Ingö and Magerö. These extend to the North Cape, but hereafter the skjærgaard ends abruptly. The coast to the E. is of widely different character; flat mountain wastes descend precipitously to the sea without any islands beyond, save Vardö, with two low islets at the E. extremity of Norway. The fjords are broader in proportion to their length. The chief are Porsanger, Laxe and Tana, opening N., and Varanger opening E. N. of this fjord the land is low and the landscape monotonous; on the S. a few island and branch fjords break the line of the shore.

Stavanger Fjord has an extreme depth of 380 fathoms; Hardanger Fjord 355, Sogne Fjord 670, Nordfjord 340, Trondhjem Fjord 300, Ranen Fjord 235, Vestfjord 340, Alten Fjord 225, and Varanger Fjord 230. Marine terraces are met with in the E. of the country, and near Trondhjem, at 600 ft. above sea-level; and they are also seen at a slighter elevation at the heads

of some western fjords. Moreover, at some points (as on the Jæderen coast) "giant kettles" may be observed close to sea-level, even below the level of high tide; and these glacial formations indicate the greater elevation of the land towards the close of the Glacial epoch. Former beach-lines are most commonly to be observed in northern Norway (e.g. in Alten Fjord), and in some cases there are two lines at different altitudes. The land above the raised beach is generally bare and unproductive, and human habitation tends to confine itself in consequence to the lower levels.

Hydrography.—In S.E. Norway there are long valleys, carrying rivers of considerable size, flowing roughly parallel but sometimes uniting as they approach the sea. The Glommen, rising N. of Røros in Aursund Lake, and flowing with a southerly curve parallel with the frontier for 350 m. to the Skagerrack, is the largest river in the Scandinavian peninsula. Its upper middle valley is called Österdal,¹ the richest timber district in Norway. Its drainage area is 16,000 sq. m. Seven miles above its mouth it forms the fine Sarpsfos, and not far above this it traverses the large lake Öieren. A right bank tributary, the Vormen, has one of its sources (under the name of Laagen) in Lake Lesjekogen, which also drains in the opposite direction to the Rauma. The stream, after watering Gudbrandsdal, enters Mjösen, the largest lake in Norway. It is 60 m. long, but, like most of the greater Norwegian lakes, has no great breadth. It has, however, an extreme depth of 1500 ft. The Drammen river, which enters a western arm of Christiania Fjord below the town of Drammen, is the common outlet of several large rivers. The Hallingdal river drains the valley of that name, and forms Lake Kröderen, which is connected with the Drammen river by the Snarum. A short distance above the junction the Drammen flows out of Lake Tyrifjord, 50 sq. m. in area, into which flow the united waters of the Rand, from the valley district of Valdres, and the Bæгна. The whole basin of the Drammen has an area of 6600 sq. m. The rivers between Christiania Fjord and Lindesnæs preserve the characteristics of those of the Glommen and Drammen systems. They rise on the Hardanger Vidde or adjacent uplands. The most important are the Laagen (to be distinguished from the river of that name in Gudbrandsdal), draining the Numedal; the Skien, the Nid and the Otter. Lakes are very numerous, the chief, beyond those already named, being Nordsjö on the Skien river, Tinsjö in the same system, which receives the river Maan, famous as forming the Rjukanfos (smoking fall) of 415 ft., and Nisservand on the Nid. The larger lakes lie, with a certain regularity, at elevations about 400 ft. above the sea, and it is considered that their basins were the heads of fjords when the land lay at a lower level, and were formed during an earlier glacial period than the present fjords. The great Lake Fæmund, lying E. of the Glommen valley and drained by the river of the same name, which becomes the Klar in Sweden, to which country it mainly belongs, is similar in type to the lakes of the northern highlands of Sweden. The streams of the coast of Jæderen reach the sea through sluggish channels, brown with peat.

Not only do the valleys of the W. far surpass in beauty those of the S. and E., but they carry streams of much greater volume in proportion, owing to the heavier average rainfall of the W. slope. The first to be noted is that of the Sand or Logen river, a brilliant, rapid stream, famous for its salmon-fishing, which debouches at Sand into Sands fjord. The valley which opens from Odde at the head of a branch (Sör fjord) of Hardanger Fjord, is noted as containing two of the finest waterfalls in Norway. The one, Lotefos (which is joined by the smaller Skarsfos), is a powerful cataract following a tortuous cleft. The other, Espelandsfos, is formed by a very small stream; it falls quite sheer and spreads out like a fine veil. The only other considerable river entering Hardanger Fjord is the Bjoreia, with its mouth at Vik in Eidfjord. On this stream is the magnificent Vöringsfos. Lesser streams within the basin of the Hardanger form the Skjæggedal and several other beautiful falls. From Hardanger N. to Romsdal the streams of the W. slope are insignificant, but there are several splendid valleys, such as the sombre Nærödal, which descends to the Nærö branch of Sogne Fjord, or the valleys which sink S. and N. from the Jostedalbræ to the head branches of Sogne Fjord and Nordfjord respectively. Above those of Nordfjord is a series of lakes, Olden, Loen and Stryn, whose milky waters are supplied almost directly from the Jostedal glaciers, while above Eidsfjord a corresponding trough contains Lake Hornindal. The next important valley is the Romsdal, the stream of which, the Rauma, forms the W. outlet of Lake Lesjekogen, as the Laagen forms the E. This lake, which lies 2011 ft. above sea-level, is the most remarkable example of an indefinite watershed to be found in S. Norway. N. from Romsdal the Driva debouches into Sundals Fjord, while the Orkla, draining Orkedal, the Gula draining Guldal, and the Nea or Nid, draining Lake Selbu, and

¹ The middle and upper parts of many valleys in Norway are known by different names from those of the rivers which water them, and such names may extend in common usage over the district on either side of the valley.

NORWAY & SWEDEN

Scale, 1:7,300,000

English Miles
0 50 100 150 200

- County boundaries.....
- Boundaries of Provinces in Sweden.....
- Capitals of Countries.....
- Capitals of Counties.....
- Canals.....
- Glaciers.....
- Railways.....
- Fortifications.....



A Longitude East 8° of Greenwich B Copenhagen D 20° E 24°

forming the Leros, enter Trondhjem Fjord from the S., and range in length from 70 to 100 m. The Stjördal, a beautiful wooded valley, leads up from the fjord to the lowest pass over the Trondhjem depression (at Storlien), and is followed by the railway from Trondhjem into Sweden.

N. of Trondhjem Fjord, in spite of the close proximity of the mountains to the W. coast, several considerable rivers are found, flowing generally about N.E. or S.W. in valleys nearly parallel to the coast. Such are the Namsen (85 m. in length) and the Vefsen, discharging into Namsen Fjord and Vefsen Fjord respectively, and the Dunderland, flowing into Ranen Fjord. In the basin of the same fjord is the short Rös river, which drains Rös Vand, second in extent of the Norwegian lakes. In the extreme N., where the coastward slope is longer, there are such large rivers as the Alten, 98 m. long, discharging into the fjord of that name, and the Tana, also giving name to the fjord into which it flows, and forming a great part of the Russo-Norwegian frontier. It is 180 m. long, and drains an area of 4000 sq. m.

Though the lakes of Norway are not comparable with those of Sweden as regards either number or size, they are very numerous and are estimated to cover somewhat less than one-fortieth of the total area.

Glacial Action.—While the coast is considered to owe its fjords and islands to the work of former great glaciers, the results are even more patent inland. The actual tracks of the old glaciers are constantly to be traced. Nowhere are the evidences of glacial action better illustrated than in the barren tract behind the low coastal belt of Jæderen. Here are vast expanses of almost naked rock, often riven and piled up in fantastic forms; numerous small lakes or bogs occupy the rock basins, and vast numbers of perched blocks are seen, frequently poised in remarkable positions. The great valleys of Norway are of U-section and exhibit the irregular erosive action of the glaciers, as distinct from the regular action of the rivers. If a main glacier, after working steadily in the formation of its trough for a considerable distance, be imagined to receive an accretion of power at a certain point, it will begin from that point to erode more deeply. The result of such action is seen in the series of ledges over which the main rivers of Norway plunge in falls or rapids.

Geology.—Norway consists almost entirely of Archaean and Lower Palaeozoic rocks, imperfectly covered by glacial and other recent deposits. The whole of the interval between the Devonian and the Glacial periods is represented, so far as is known, only by a small patch of Jurassic beds upon the island of Andö. An archaean zone stretches along the W. coast from Bergen to Hammerfest, interrupted towards the N., by overlying patches of Palaeozoic deposits. Gneiss predominates, but other crystalline rocks occur subordinately. The Lofoten Islands consist chiefly of eruptive granite, syenite and gabbro. S. of a line drawn from the head of the Hardanger Fjord to Lake Mjösen is another great Archaean area. Here again gneiss and granite form the greater part of the mass, but in Telemarken there are also conglomerates, sandstones and clay-slates which are believed to be Archaean. Between these two Archaean areas the Lower Palaeozoic rocks form a nearly continuous belt which follows approximately the watershed of the peninsula and extends from Bergen and Stavanger on the S. to the North Cape and Vardö in the N. They occur also as a broad strip inland in the Archaean floor, from the Christiania Fjord northward to Lake Mjösen. A line drawn from the Nase to the North Cape coincides roughly with a marked change in the character and structure of the Palaeozoic beds. East of this line even the Cambrian beds are free from overfolding, overthrusting and regional metamorphism. They lie flat upon the Archaean floor, or have been faulted into it in strips, and they are little altered except in the neighbourhood of igneous intrusions. W. of the line the rocks have been folded and metamorphosed to such an extent that it is often difficult to distinguish the Palaeozoic rocks from the Archaean. They form in fact a mountain chain of ancient date similar in structure to the Alps or the Himalayas. The relations of the two areas have been studied by A. E. Törnebohm in the Trondhjem region, and he has shown that the western mass has been pushed over the eastern upon a great thrust-plane. The relations, in fact, are similar to those between the Dalradian schists of the Scottish Highlands and the Cambrian beds of the W. coast of Sutherland. In Scotland, however, it is the eastern rocks which have been pushed over the western. Corresponding with the difference in structure between the E. and the W. regions there is a certain difference in the nature of the deposits themselves. In the Christiania district the Cambrian, Ordovician and Silurian beds consist chiefly of shales and limestones. Farther north sandstones predominate, and especially the Sparagmite, a felspathic sandstone or arkose at the base of the Cambrian; but the deposits are still sedimentary. In the Trondhjem district, on the other hand, belonging to the folded belt, basic tuffs and lavas are interstratified with the normal deposits, showing that in this region there was great volcanic activity during the early part of the Palaeozoic era. In both the E. and the W. region the Devonian is probably represented by a few patches of red sandstone, in which none but obscure remains of fossils have yet been found. It may be noted here that in the extreme N. of Norway, E. of the North Cape, there is a sandstone not unlike the Sparagmite of the S., which is said by Reusch to contain ice-worn pebbles and to rest upon a striated pavement of Archaean rocks.

The Mesozoic era is represented only by the sandy deposits with seams of lignite which occur on the island of Andöen in the Vester-aalen. They contain remains of plants and have been correlated with the Lower Oolite of Great Britain. No Tertiary beds have been found, but Pleistocene deposits of various kinds are met with. The evidences of ice action during the Glacial Period are conspicuous over the whole country and are similar to those in other glaciated regions. But the most remarkable features produced in recent geological times are the terraces which appear as if ruled on the sides of the valleys and fjords. They are partly platforms cut in the solid rock and partly accumulations of gravel and sand like a modern beach, and they were evidently formed by the action of waves. Some of them contain marine shells of living species and mark the former position of the sea-level; but others are of more doubtful origin and may indicate the shores of lakes formed by the damming



of the lower part of the fjords by means of glaciers, as in the case of the Parallel Roads of Glen Roy. They occur at various levels, and have been observed as high as 3000 ft. above the sea.

No volcanic rocks of modern date are known in Norway, but great intrusions of igneous rock took place in early geological times. Amongst them may be mentioned the gabbro of the Jotunfeld, and the elaeolite syenites and associated rocks of the Christiania region. The latter form the subject of a valuable series of memoirs by Brøgger, who shows that they have all been derived from a single magma, and that the differentiation of this magma led to the production of several different types of rock. (P. LA.)

Meteorology.—The most powerful influence on the climate of Norway is that of the warm drift across the Atlantic Ocean from the S.W. The highest mean annual temperature in Norway is found on the S. and W. coasts, where it ranges from 44.5° to 45.5° F., and the lowest is found at Karasjok and Kautokkeino, lying at elevations of 430 and 866 ft. respectively in Finmarken, near the Russian frontier. Here the mean temperature is 26.4°, while at Vardö, on the north coast, it is 33°. At Rörös (2067 ft.) at the head of the Glommen valley, and at Fjeldberg (3268 ft.) in the upper Hallingdal, the mean annual temperature is 31°. The longest winter is found in the interior of Finmarken, 243 days with a mean temperature below 32° being recorded at

Kautokeino, contrasted with 205 at Vardö. In the S. uplands (as at Fjeldberg) there is an average of 200 such days, and at Christiania about 120. On the S.W. coast there is no day of which the mean temperature falls below 32°; the most westerly insular stations, however, such as Utsire and Skudenness off Bukken Fjord, record frost during some part of 60 days. The lowest winter average temperature is found in a centre of cold in the N. which extends over Swedish and Russian territory as well as Norwegian. The Norwegian station of Karasjok, within it, records 4° during December, January and February, and in this area there have also been observed the extreme minima of temperature in the country, e.g. 60.5° below zero at Karasjok. The contrast with the S.W. coast may be continued. Here at some of the island stations, the coldest month, February, has an average about 35°, and the lowest temperature recorded at Ona near Christiansund is 10.5°. It may be noted here that in several cases the lower-lying inland stations in the south show a distinctly lower winter temperature than the higher in the immediate vicinity. Thus the average for Rörös (2067 ft.), 13°, contrasts with 11° for Tönset; at Listad in Gudbrandsdal (909 ft.) it is 16.5°, but at Jerkin in the Dovre Fjeld (3160 ft.) it is 17.5°. The summer is hottest in S.E. Norway (Christiania, July, 62.5°). On the other hand, the lowest summer average in the interior of Finmarken is not less than 53.5° in July; but at Vardö it is only 48° in August, usually the warmest month on this coast. In the lofty inland tracts of the S.E. the July temperature ranges, from 59° in the valleys, to as low as 49° at the high station of Jerkin. The interior having a warm summer and a cold winter, and the coast a cool summer and a mild winter, the annual range of temperature is remarkably greater inland than on the coast.

An important result of the warm Atlantic drift is that the fjords are not penetrated by the cold water from the lower depths of the outer ocean, and in consequence are always ice-free, except in winters of exceptional severity in the innermost parts of fjords, and along shallow stretches of coast.

The sun is above the horizon at the North Cape continuously from the 12th of May to the 29th of July, and at Bodö, not far from the Arctic circle, from the 3rd of June to the 7th of July.

Even at Trondhjem there is practically full daylight from the 23rd of May to the 20th of July. Even in the extreme S. of Norway there is no darkness from the end of April to the middle of August. In winter, on the other hand, the sun does not rise above the horizon at the North Cape from the 18th of November, to the 23rd of January, and at Bodö from the 15th to the 27th of December. There is only a twilight at midday. In the extreme S. the sun is above the horizon for 6½ hours at mid-winter.

The prevailing winter winds are from the land seaward, while the system is reversed in summer. The winds in Norway may therefore be roughly classified according to locality thus:—

	South-east Coast (Skagerrack).	West Coast.	North.
Winter . . .	N.E.	S.	S.W.
Summer . . .	S.W. to W.	N.	N.

The force of the wind is greater in winter on the coast; inland, on the contrary, the winter is normally calm; and at all seasons, on the average, the periods of calm are longer inland than on the coast. The average annual number of stormy days, however, ranges from ten to twenty on the S. coast, from forty-five to sixty-two on the coast of Finmarken, and sixty to seventy at Ona; whereas in the interior of Finmarken the average number is four, while in the S. inland districts stormy days are rare. December and January are the stormiest months. Hailstones are rare and seldom destructive. Thunderstorms are not frequent. They reach a maximum average of ten annually in the Christiania district.

The number of days on which rain or snow falls is greatest on the coast from Jæderen to Vardö, least in the S.E. districts and the interior of Finmarken. At the North Cape, in Lofoten, and along the W. coast between the Stad and Sogne Fjord, precipitation occurs on about 200 days in the year, although by contrast in the inner part of Sogne Fjord there is precipitation only on 121 days. On Dovre Fjeld and the S.E. coast the average is about 100 days. Snowfall occurs least frequently in the S. (e.g. at Mandal, 25 snowy days out of 116 on which precipitation occurs), increasing to 50 at Christiania, or Dovre Fjeld, and about the mouth of Trondhjem Fjord, to 90 at Vardö, and to 100 at the North Cape. From Vardö to the Dovre Fjeld and in the upland tracts, snow occurs at least as frequently as rain. Snowfall has been recorded in all months on the coast as far S. as Lofoten. The amount of precipitation is greatest on the coast, where, at certain points on the mainland between Bukken Fjord and Nordfjord, an annual average of 83 in. is reached or even exceeded. On the outer islands there is a slight decrease; inland the decrease is rapid and great. In Dovre Fjeld a minimum of 12 in. is found. In the extreme S. of the country the average is 39 in., N. of Trondhjem Fjord 53 in. are recorded, and there is a well-marked maximum of 59 in. at Svolvær in Lofoten, N. of which there is a diminution along the coast to 26 in. at the North Cape. In the northern interior a minimum of 16 in. is recorded. Strongly marked local variations are observed.

The amount of cloudiness is on the whole great. The coast of

Finmarken has over three cloudy days to one clear day; in the interior of the country clear and cloudy days are about equally divided. Fog is most frequent on the W. and N.W. coasts in summer; on the S.E. coast in winter. In winter a frosty fog often occurs about the heads of the fjords during severe cold or with a breeze from the land.

Flora.—The forests of Norway consist chiefly of conifers. The principal forest regions are the S.E. and S. Here, in the Trondhjem district, and in Nordland there are extensive forests of pine and fir. In the coastal and fjord region of the W. the pine is the only coniferous forest tree, and forests are of insignificant extent. In S. Norway the highest limit of conifers is from 2500 to 3000 ft. above sea-level; in the inland parts of the Trondhjem region it is from 1600 to 2000 ft. (though on the coast only from 600 to 1200); farther N. it falls to 700 ft. about 70° N. The birch belt reaches 3000 to 3500 ft. Next follow various species of willows, and the dwarf birch (*Betula nana*), and last of all, before the snow-line, the lichen belt, in which the reindeer moss (*Cladonia rangiferina*) is always conspicuous. A few trees of the willow belt sometimes extend close up to the snow-line. In the S. and less elevated districts the lowest zone of forests includes the ash, elm, lime, oak, beech and black alder; but the beech is rare, flourishing only in the Laurvik district. The snow ranunculus and the Alpine heather are abundant. The Dovre Fjeld is noted as the district in which the Arctic flora may be studied in greatest variety and within comparatively narrow limits. On the coastal banks the marine flora is very finely developed.

Fauna.—The great forests are still the haunt of the bear, the lynx, and the wolf. Bears are found chiefly in the uplands N. of Trondhjem, in the Telemark and the W. highlands, but the cutting of forests has limited their range. The wolves decreased very suddenly in S. Norway about the middle of the 19th century, probably owing to disease, but are still abundant in Finmarken, and the worst enemy of the herds of tame reindeer. The elk occurs in the eastern forests, and northward to Namdal and the Vefsen district. The red deer is confined chiefly to the W. coast districts; its principal haunt is the island of Hitteren, off the Trondhjem Fjord. On the high fjelds are found the wild reindeer, glutton, lemming and the fox (which is of wide distribution). The wild reindeer has decreased, though large tame herds are kept in some parts, especially in the N. The lemming is noted for its curious periodic migrations; at such times vast numbers of these small animals spread over the country from their upland homes, even swimming lakes and fjords in their journeys. They are pursued by beasts and birds of prey, and even the reindeer kill them for the sake of the vegetable matter they contain. Hares are very common all over Norway up to the snow-line. The beaver still occurs in the Christiansand district.

Game birds are fairly abundant in most districts. The most notable are the two sorts of rype, the *skov* or *dal rype* (willow grouse, *lagopus albus*) and the *fjeld rype* (*lagopus alpina*). Black grouse are widely distributed; hazel grouse are found mainly in the pine forests of the E. and N., as are capercaillie. Woodcock and snipe are fairly common. The partridge is an immigrant from Sweden, and occurs principally in the E. and S.E. A severe winter occasionally almost exterminates it. A very large proportion of the Norwegian avifauna consists of geese and ducks, various birds of prey, golden plover, &c. These birds, at the autumn migration, leave by three well-defined routes—one from Finmarken into Finland, one by the Christiania valley, and one by the W. coast, where they congregate in large numbers on the lowlands of Jæderen. The Lapland bunting and snow bunting (*Plectrophanes laponica* and *nivalis*), the snowy owl (*nyctalea scandiaca*) and rough-legged buzzard (*archibuteo lagopus*) and sea-birds are exceedingly numerous. In some localities such birds as the puffin and kittiwake form great colonies (*fugleberge*, bird cliffs).

The common seal is very frequent; and arctic seals and occasionally the walrus visit the northern coasts; among these the harp seal (*phoca groenlandica*) is believed to be particularly destructive to the fisheries. These last are of great importance; a large number of the best food-fisheries occur along the coasts, including cod, herring, mackerel, coal-fish, &c. The basking shark was formerly of some economic importance; the Japanese shark, a strictly local variety, also occurs in the neighbourhood of Vardö. Various small species of whales visit the coast; among these the lesser rorqual may be mentioned, as an antique method of hunting it with bow and arrows is still practised in the neighbourhood of Bergen. In the fjords many invertebrates as well as fish are found. Of fresh-water fish the salmonidae are by far the most important. Next to these, perch, pike, gwyniad and eel are most common.

As regards insect life, Norway may be divided into three areas, the S. being richer than the W., while the N. is distinct from either in the number of peculiarly arctic insects.

Sport.—Norway is much frequented by British anglers. Moderate rod-fishing for trout is to be obtained in many parts. But most of the owners of water rights have a full appreciation of the value of good fishing to sportsmen, especially when netting rights are given up for the sake of rod-fishing. The same applies to good shooting. Foreigners may not shoot without a licence, the cost of which is 100 kroner (£5 : 11 : 0) whether on crown lands or on private properties, whose owners always possess the shooting rights.

**Marine
fauna.**