Chapter 25 Close of Tertiary Igneous Period to Recent

Subsequently to the Tertiary igneous period, erosion on a vast scale was responsible for removing many thousands of feet of rock that formed the cover for the Tertiary plutonic rocks of the Western Highlands. Widespread submergences also would appear to have taken place, for planes of marine erosion have been postulated by various writers to account for the general summit-level of 3000 ft. met with throughout much of the Scottish Highlands, and for the Lorne Plateau at about 1000 ft., typically developed in the Oban and Loch Awe district. A more recent submergence, marked by a pre-glacial coast-line, up to about 140 ft. (O.D.) is demonstrable within the present area (Sheet 51).

The Pleistocene ice-sheet effected further erosion, and to its action may be ascribed the absence of any superficial deposits of Tertiary age of later date than the lavas. Since the withdrawal of the ice there have been accumulations of alluvium, both marine and fresh water, peat, and blown sand. Repeated upheaval has affected the earlier deposits of this suite, as is witnessed by raised beaches that often fringe the coasts up to heights of about 100 ft. above the sea.

Erosion since Igneous Period

As Sir Archibald Geikie and Prof. Judd have pointed out, Ardnamurchan and the other Tertiary plutonic districts of the West of Scotland furnish particularly impressive evidence of erosion of later date than the Early Tertiary volcanic episode. Plutonic rocks require considerable cover at the time of their consolidation, and probably thousands of feet have been removed from even the highest of the gabbro summits of Ardnamurchan. Further erosion is indicated by the valley system carved in gabbro. This additional excavation has proceeded to a depth of some 1300 ft. (the highest hill of the complex, Meall nan Con, 1431 ft., in Sheet 52, consists of baked agglomerate and is therefore not considered in this estimate). The Tertiary lavas of North-west Mull have been eroded into a valley system of the same order of magnitude, for Càrn Mòr in Sheet 51 reaches 1122 ft., 2 miles inland from the sea.

Obscure plateaux

A considerable part of the South-west Highlands can be classed as a dissected tableland, sometimes spoken of as the Lorne Plateau. The general summit-level lies Soo or 1000 ft. above the sea. It has been suggested in the Tertiary Mull Memoir that the greater part of Mull, other than the central mountains and Gribun Peninsula, may be treated as a rather: vague northward extension of this Lorne Plateau. The same suggestion applies to the Ardnamurchan plutonic complex. This latter does not approach in summit-level the central mountains of Mull, where it is evident that we have to deal with relics of the dissected 3000-ft. plateau so widely recognizable in many parts of the Highlands.

Coll belongs to a set of low, ill-defined plateaux, other examples of which are furnished by Tiree and Iona, and the western part of the Ross of Mull. By far the greater part of Coll is less than 200 ft. above the sea; and the highest hill, Ben Hogh, rising to 339 ft., stands up prominently by itself. It is probable that much of the levelling down of Coll has been the result of direct marine erosion of late Tertiary date.

Pre-Glacial Marine notch about the 100-ft. level

At a late stage in pre-Glacial times, when previous erosion had determined much of the present-day coastal form of Mull and Ardnamurchan, a submergence took place which has left pronounced traces from 100 to 160 ft. above the modern high-water mark. These traces were first noticed and investigated by Dr. W. B. Wright in Colonsay, Islay, Mull, and the Treshnish Isles.<ref>W. B. Wright, On a Pre-Glacial Shore-line in the Western Isles of Scotland, Geol. Mag., 1911, p. 97, and with others in Tertiary Mull Memoir, 1924, chap. xxxvi.</ref> As regards the part of North-west Mull that falls within Sheet 51, Dr. Wright has given the following account.

'The southern shores of Calgary Bay (Sheet 51) show only poor remnants of the pre-Glacial beach serving locally as a platform for the road. On the northern shores, however, the notch resumes the magnificent development exhibited farther

south, and this it maintains round the shore of Mornish as far as Caliach Point. It is, in fact, a conspicuous object from the tourist-steamer plying between Oban, Staffa, and Iona. In one or two places its surface has an appearance of ice-moulding. An Abney-level measurement gave 115 ft. about a mile south of Caliach Point; but similar variations (105–120 ft.) are met with here as farther south. Another estimate at the head of Calgary Bay gave 110 ft. above high-water mark, with variations between 95 ft. and 115 ft.'

The pre-Glacial date of the notch just described cannot be demonstrated on local evidence. The notch, however, is obviously a product of prolonged marine erosion, for which no corresponding beach deposits have been found. In more southerly exposures, attributed to the same notch, examples have been noted of striation and ice-moulding and of cover by boulder-clay. For these the reader may refer to the Tertiary Mull Memoir.

In Ardnamurchan a similar pre-Glacial marine notch is recognizable on the north-west side of Kilchoan Bay. It runs along the hill-slopes for a distance of a mile as a conspicuous feature of the landscape (Figure 54). At its north-east end it was found to stand 145 ft. above O.D., which would correspond roughly with 140 ft. above high-water mark.

The pre-Glacial age of this. high-level Kilchoan notch is strongly suggested by the following facts:

1. No gravels are preserved in connexion with the notch. The highest gravels are those of the late-Glacial t00 ft. beach exposed, for instance, at the Free Church Manse.
2. The platform of the notch has suffered a modelling by erosion that does not seem to have effected the late-Glacial and post-Glacial beach gravels, which occur as well-preserved flats at lower levels.

The same notch is recognizable on the north coast of Ardnamurchan, near Achateny, and will be described in the Memoir on Sheet 52.

Glaciation

Striae

Western Ardnamurchan retains abundant striae, mostly directed approximately west-north-west. Ice-moulding is extremely characteristic of the bare eucrite crags, which frequently show *roche moutonnée* forms.

In North-west Mull the striae fall into two main categories, and are due to ice movements directed to the west and north-west respectively. Of the former we may note the following directions: north of west, a mile south of Glen Gorm Castle; west and southwest, near Dervaig; and south of west, on Ben Bhuidhe. The north-west striae are well seen near Loch Frisa and at Dervaig.

In South-western Coll no striae seem to have been preserved; but in the north-west half of the island the following instances have been noted, with a general north-westerly trend:

N.W. and W. 30° N. (doubtful occurrences). North-west coast. At crossing of stream and footpath a side of sand dunes, 0.5 mile west of Cornaigbeg

N.W. North-west coast. West side of headland, 0.5 mile N.W. of Cornaigbeg

N.W. Near north-west coast. Side of stream, about 300 yds. S.E. of Bousd

W. 10° N. North coast. 80 yds. S. of Rudha Mor, on steep rock face

W.N.W. North coast. 200 yds. N.N.E. of Eileraig, at side of inlet

W. 15° N. North coast. N.E. end of Sorisdale Bay

N. 30° W. East coast. 400 yds. E.N.E. of Meall nan Uan. Head of small inlet

James Geikie, on his map illustrating the glaciation of the Outer Hebrides,<ref>J. Geikie, On the Glacial Phenomena of the Long Island, or Outer Hebrides, Second Paper, *Quart. Journ. Geol. Soc., vol. xxxiv.,* 1878, Plate xxxiii, p. 819</ref> has marked the occurrence of *roches moutonnées* in Coll, showing a west-north-west direction of ice-flow.

Erratics

TheTertiary igneous- rocks of Ardnamurchan were completely overridden by ice from the south-east, as is clearly testified both by striae and erratics. Conspicuous among the latter are boulders of the Morven granite.

The same granite is found as erratics over the whole of Northwest Mull. Its carry is to be associated with the westward set of striae. Boulders of Central Mull granophyre (probably from Glen Forsa) are found near Dervaig. They were presumably distributed by the current responsible for the north-west striae.

In Coll it is very difficult to find erratics foreign to the island, except at levels that have been reached by the sea since the withdrawal of the ice-sheet. There is, however, one very conspicuous boulder of dark olivine-gabbro which must have been carried into position by land-ice. It measures 8 x 7 x 4 ft., and stands on pale gneiss, 200 ft. above sea-level, on the rocky slopes of Ben Hogh, 300 yds. north-west of the head of Loch nan Cinneachan. This boulder (S21329) [NM 1865 5716] is certainly derived from a Tertiary gabbro. Its most likely source is Ben Buie, Mull; but it must be remembered that it may have been transported for some distance by floating ice previous to the advance of the ice-sheet that carried it to its present position.

Drift

Thereis extremely little glacial drift anywhere in the one-inch Sheet. A doubtful deposit is shown near Clabhach, on the north-west coast of Coll. It is a rubble, mostly composed of unworn gneiss, accompanied by subordinate basalt such as might have been supplied by the dykes of the island. The matrix is somewhat sandy, with traces of water-assortment. No striae were seen on the stones or on the pavement upon which they rest.

The material is like much of the morainic drift of the Highlands, but is not well characterized, and is possibly marine, for the exposures extend but little above the 100 ft. level. Somewhat similar rubble is seen in a few roadside pits between Arinagour and Acha. The greatest elevation here is 120 ft., and the conclusion was reached that most of the deposit was of marine origin.

Raised beaches

In North-west Mull, a conspicuous terrace of high-level gravels, belonging to the Late-Glacial 100 ft. Beach, skirts the coast for a mile and a half southwards from Quinish Point.<ref>G. V. Wilson in Tertiary Mull Memoir, 1924, P. 402.</ref> In Ardnamurchan, within Sheet 51, the only extensive raised-beach deposits are found along Kilchoan Bay. Here, raised-beach margins are somewhat ill defined, though it is possible to identify beach-terraces at different levels. As already mentioned, high-level deposits of shingle extend up to about 85 ft. (O.D.) near the Free Church manse, half a mile inland from the head of the bay, and are classed with the 100 ft. Beach.

Raised-beach deposits at lower levels fringe the coast along the west side of Kilchoan Bay, the lowest terrace being only about 10 to 12 ft. above high-water mark. The shore-line connected with the last-mentioned deposits is ill defined, though recognizable at intervals, a contrast to the marked erosion accompanying the lowest or 25-ft. Post-Glacial Beach farther south. This contrast has been already discussed in the Tertiary Mull Memoir,<ref>E. B. Bailey in G. V. Wilson in Tertiary Mull Memoir, 1924, p. 408. 8</ref> from which (Figure 53) is reproduced. On this figure, it will be seen that North-west Mull, as well as Ardnamurchan, lies within the northern region. In North-west Mull the level of the lowest raised beach appears to be slightly higher than in Ardnamurchan. For example,<ref>W. B. Wright in G. V. Wilson in Tertiary Mull Memoir, 1924, p. 411.</ref> at the head of Calgary Bay, the inner angle of the beach lies at a height of 20 ft. or so (h.w.m.). Again, Dun Ban, on Mingary turd, is connected by a spit of gravel rising to 39 to 40 ft. (h.w.m.), and having an angle of erosion at its base at about 25 ft. It is not clear whether this spit is a product of the post-Glacial shoreline. The amount of gravel on the modern shore is small. The beach may have an elevation of anything from i8 to 20 ft. in this

district.

In Coll, raised-beach deposits are widespread. The material varies from well-washed gravel to sand and mud, and has, for the most part, been left in hollows among rocks. Along the coast, especially the north-west coast, the raised-beach gravels are to a large extent concealed by blown sand, and, farther inland, probably a good deal of the scattered peat is underlain by similar gravels. The deposits extend from sea-level up to about the 100 ft. contour. There has, however, been little tendency towards the formation of flat terraces, and it has seldom been possible to assign deposits to any particular beach-level. Accordingly a generalized raised-beach symbol is employed on the one-inch Map.

One of the most marked beach flats is at Arivirig, on the east side of Loch Eatharna. The height here extends roughly from 20 ft. up to about 50 ft., and the terrace is still partly peat-covered. Three miles farther south-west two distinct terraces have been traced for a short distance along the shores of Port na h-eitheir, but this is a very exceptional phenomenon.

At the following localities the nature of the deposits may be studied:-

1. Near Grishipoll farm in a roadside pit: well-washed gravel of marine aspect, at about the w0 ft. level.
2. A quarter of a mile east of Acha on the Friesland farm road: 4 ft. of dark gritty false-bedded sand with irregular wisps of water-worn pebbles, at a level somewhat less than 100 ft.
3. North of Arinagour School: shingle on water-worn rocks, at about the 70 ft. level.
4. At the roadside between Arnabost and Arinagour School: several pits in gravel, at about the 50-ft. level.
5. Loch Chad has beach ridges or spits at both ends, north-east and south-west, at about the 50-ft. level. Some of these ridges are made of boulders.
6. Minor shingle spits are seen, at lower levels, near Rudh a'Bhinnein, on the north-west coast, and at the inlet west of Coalas an Eilein, south of Arinagour.

Peat

In Western Ardnamurchan (Sheet 51), small spreads of peat of workable thickness are frequently met with on the lower ground between the hills. In North-west Mull, extensive deposits have been mapped south-east of Dervaig and also near the east margin of the one-inch Map at Criadhach Mhor. Elsewhere, though peat is of general occurrence, it forms only small spreads in this lava-featured country.

In Coll, extensive deposits of peat cover the low ground (raised beach) on either side of the Arinagour–Acha road, in the south-east of the island. In the past they were largely cut for fuel by the inhabitants of Tiree, in which island peat is practically absent. In the north-east end of Coll, north-east of the Arinagour–Amabost road, much scattered peat occurs in hollows among the rocks. The deposits are usually so small and inaccessible, however, that they are little utilized.

The occurrence of so much peat in Coll, and its almost complete absence from the neighbouring and very similar island of Tiree, is a curious phenomenon, the explanation of which is not obvious.

Blown Sand

In Western Ardnamurchan, a broad strip of blown sand extends along Sanna Bay for two thirds of a mile. Locally, the material is largely made up of shell fragments. In North-west Mull, a purer deposit of shell-sand (with 70 per cent. $CaCO_3$), probably blown in from the present shore, occurs at the head of Calgary Bay.<ref>G. V. Wilson in Tertiary Mull Memoir, 1924, p. 419.</ref>

A fringe of blown sand, generally rich in shell fragments, is a characteristic feature of most of the north-west coast of Coll. Local patches of the Shelly debris are cemented to form a soft limestone. Towards the west of the island, blown sand comes in from the south as well as the north. Thus southern sand from Crossapol Bay unites with northern sand from Feall Bay to give the most extensive spread of the island. Dunes are very commonly developed. E.B.B., J.E.R., V.A.E.,

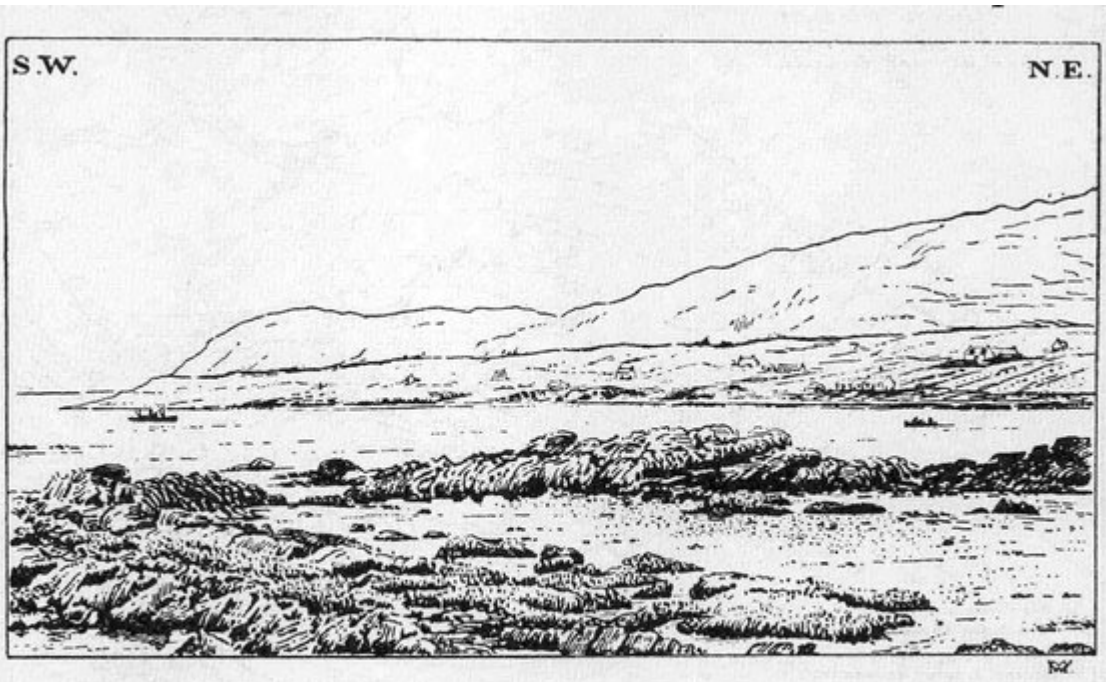

FIG. 54.—*View of Kilchoan Bay, from the east, showing Pre-Glacial Marine Rock-notch at 140 ft. along west side of bay.*

Drawn from Geological Survey Photograph No. C. 2821.

(Figure 54) View of Kilchoan Bay, from the east, showing Pre-Glacial Marine Rock-notch at 140 ft. along west side of bay. Drawn from Geological Survey Photograph No. C2821.

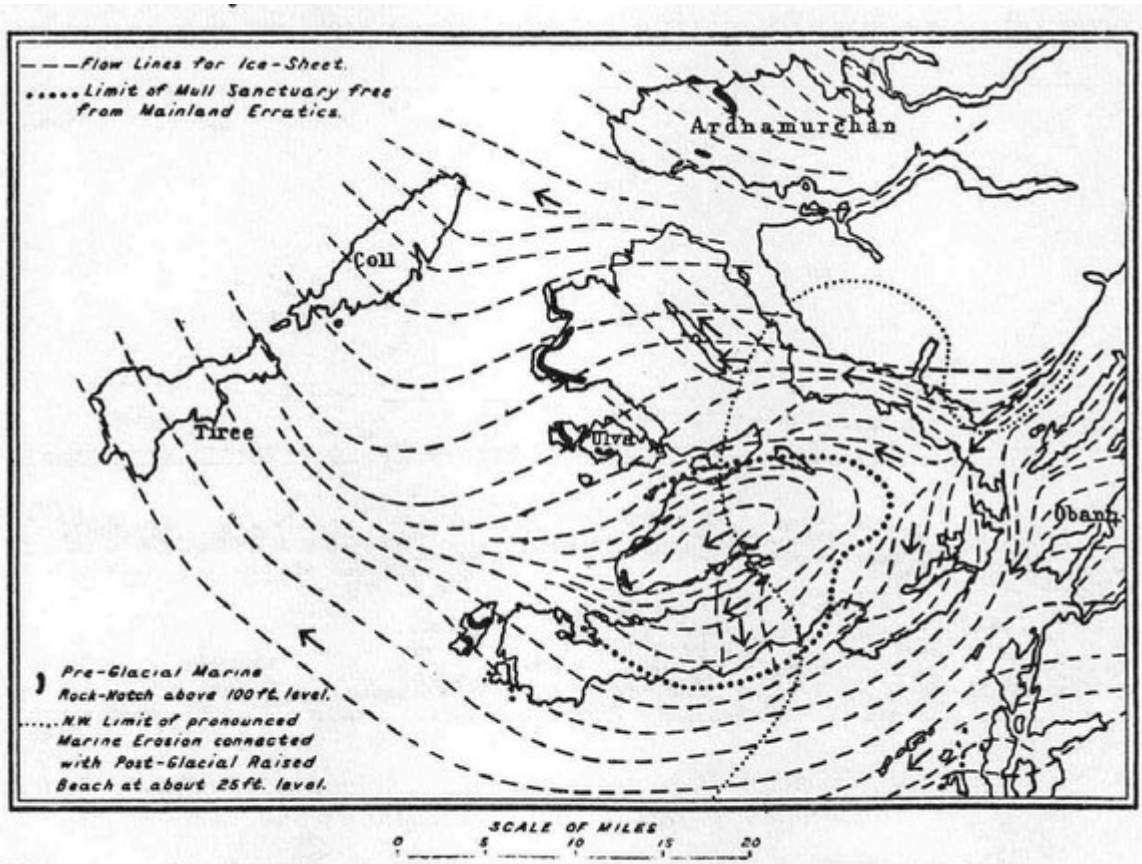

FIG. 53.—*General Glaciation of District, and some Raised-Beach phenomena.*

Quoted from 'Tertiary Mull Memoir,' 1924, Fig. 65, p. 395.

(Figure 53) General glaciation of district, and some raised-beach phenomena. Quoted from Tertiary Mull Memoir, 1924, (Figure 65), p. 395.