
Chapter 9 Tertiary Basal Sediments, Ardnamurchan

With the exception of a little Cretaceous *remanié*, Inferior Oolite, with probably a few feet of Great Estuarine Series, is the latest Mesozoic rock preserved in Ardnamurchan. Inferior Oolite is found *in situ* south-west of Kilchoan Bay and as blocks in a volcanic neck at Achateny, on the north coast. In exposures on the north side of Ben Hiant, and in others south-east of Loch Mudle, nothing later than the bottom Pabba Beds of the Lower Lias has been preserved beneath the Tertiary. In much of the country east of Ben Hiant, basal Tertiary sediments rest directly on Moine Schists. Thus, in a distance of about five miles, the Tertiary transgresses some 700 ft. of Jurassic strata.

In Morven, south of Ardnamurchan, Prof. Judd found Upper Cretaceous fairly widely distributed. It there succeeds Lower Lias—Broadford Beds or Pabba Beds, according to locality. In south-eastern Mull, Upper Cretaceous lies directly on Lower Lias and Inferior Oolite; in southern Mull, on Middle and Upper Lias; in western Mull, on Rhxtic and Lower Lias. It is clear, therefore, that early Cretaceous erosion removed large thicknesses of Jurassic strata from Morven and Mull. At one point in Ardnamurchan, Mr. Simpson has found what he regards as *remanié* Chalk flint, along with a shark's tooth, embedded in a basal Tertiary coal that rests directly on schist. If it be correct to interpret this Upper Cretaceous material as practically untravelled, it would seem as if, here too, the Jurassic had been eroded during early Cretaceous times.

In Ardnamurchan, as in Morven and Mull, the Tertiary lavas almost invariably rest upon a few feet of Tertiary mudstone too thin to show separately on the published maps. Other Tertiary deposits locally occur below the mudstone. The latter is of a red or greenish colour, and is usually fine in grain, though in places it contains recognizable angular volcanic material. Rounded grains of quartz are often scattered through it. These may have been derived from deposits of either Upper Cretaceous or pre-mudstone Tertiary age, for sandstones of these two dates, in Morven and Mull, frequently contain wind-rounded grains. <ref>E. B. Bailey in Tertiary Mull Memoir, 1924, pp. 54–57; and Pre-Tertiary Geology of Mull, Loch Aline, and Oban, Mem. Geol. Surv., 1925, pp. 116, 117.</ref> The origin of the mudstone has already been discussed by Mr. Bailey in the Tertiary Memoir on Mull <ref>E. B. Bailey in Tertiary Mull Memoir, 1924, PP-53, 54.</ref> Following upon a suggestion by Dr. Lee, he ascribed the mudstone to lateritic decay, under warm, moist, climatic conditions, of a widespread basaltic ash. The admixture with sand grains in Ardnamurchan points to some resorting of the original ashy material. A further indication of this is the frequently bedded appearance of the upper part of the mudstone coupled with the occurrence of a band of ironstone, resembling an impure clayband, interbedded in the deposit west of Sròn Bheag, south-west of Kilchoan.

For geographical convenience the area will be described from west to east.

Sròn Bheag

An exposure of Tertiary resting on Inferior Oolite may be visited at low tide, 350 yds. west of a projecting portion of Sròn Bheag, $1\frac{3}{4}$ miles south-west of Kilchoan. Here a high sea-cliff, of which the upper portion is composed of basalt lava, has slopes of talus and landslip extending half-way up, and at their western end Tertiary sediments can be hammered for three feet below the basal lava. Farther down the cliff, the sediments are inaccessible, but may be examined among fallen debris on the shore below.

The mudstone is present in its usual position below the basalt lavas, and includes near its top an intercalated bed of ironstone, 2 inches thick. Above the ironstone the mudstone is fine-grained, fissile and purple, while below it is more ashy looking and contains rounded quartz grains.

The mudstone rests on a thin-bedded white sandstone, fallen fragments of which are loose-textured and uniformly fine. Contact alteration by Tertiary intrusions has obscured the original form of the quartz grains in this sandstone, but the rock certainly differs in type from the reddish close-textured, more massive sandstone of Inferior Oolite age that underlies it, and it may thus belong to the Tertiary. A highly baked white sandstone, of the same type as that just described, outcrops next to basalt lavas immediately south of the gabbro complex, south-west of the twin lochs that lie south-east of Beinn na Seilg.

Glebe Hill

Tertiary lavas form the greater part of Glebe Hill, north of Kilchoan Bay. At their northern extremity, just south of a stream named Amhainn Chre Bheinn on Sheet 52, these lavas are separated from adjacent gabbro by a narrow outcrop of highly granulitized rocks, consisting of sediments and intrusions. The sediments include baked sandstone and a sapphire-spinel rock which may represent the Tertiary basal mudstone, intensely contact altered (p. 235).

Ben Hiant

Sandstones with thin layers of jet occur below ashy-looking basal mudstone on the south slope of Ben Hiant, in a stream that enters the sea half a mile east of Maclean's Nose.

Their geological age is quite uncertain. The sandstones show no wind-rounding of their grains, such as is characteristic of the Tertiary sandstones of Mull. On the other hand, they contain pebbles and angular fragments of quartz and schist, and thus resemble Trias conglomerate, an outcrop of which may be seen in another stream 200 yds. to the north-east. They lack, however, the characteristic red colour of Trias, and in addition to layers of jet they include obscure plant-remains. No exactly similar beds have been found in any other section in Ardnamurchan. Possibly they may be the equivalents of Tertiary beds, including a coal exposed farther east, to be described later.

The section is as follows:

		feet	inches
	Red mudstone (TERTIARY)	1	0
Age doubtful	Coarse yellow sandstone with quartz pebbles and angular fragments of schist	2	6
Age doubtful	Fine buff-coloured sandstone	3	0
Age doubtful	Dark sandy shale and shaly sandstone with obscure plant-remains	0	6
Age doubtful	Sandy dark bed with lenticular layers of jet	0	6
Age doubtful	Light grey marl	0	8
Age doubtful	Gap, not more than	1	0
	MOINE SCHIST		

The mudstone also outcrops in streams that join to reach the coast a mile east of Maclean's Nose. In one of these, it succeeds Trias conglomerate, and in the other it rests directly upon Moine Schists.

East of Loch Mudle Fault

East of Ben Hiant, immediately to the east of the Loch Mudle Fault, Tertiary mudstone, 3 ft. thick, lies directly upon Moine Schists, in a stream 1¼ miles north-northwest of Ardsignish. Northwards from this the stratigraphical gap at the base of the Tertiary diminishes. In a stream, 2½ miles north-north-west of Ardsignish, Lower Lias, including limestone with overlying shales, intervenes between schists and basalt lavas. The mudstone is here absent, as is also the case in a stream section farther north at the north margin of the Ardsignish lava outcrop, south-east of Loch Mudle. There the basal lava rests directly on Lower Lias, either shales or limestone. J. E.R.

A little farther east, south of the east end of Lochan a' Mhadaidh Riabhaich, conglomeratic sandstone is seen, probably *in situ*. Near by, to the west, 10 ft. of Lower Lias limestone are exposed, but it has not been found possible to determine the age relation of the conglomerate to the limestone. It remains an open question whether the conglomerate is Trias or Tertiary. At the head of a streamlet, 2 miles south-east of Loch Mudle (beyond the eastern margin of the Memoir-map), one inch of carbonaceous sandstone is all that separates lavas and schists — analogy with Mull and Morven makes it

certain that this carbonaceous layer is of Tertiary age. Half a mile farther south, blocks of conglomerate are strewn along the base of the lava escarpment, and in one case, half a mile farther south again, 5 ft. of conglomerate are exposed *in situ*. This brings us near the first of the little streams that run across the lava base and drain directly into Loch Sunart. Three of these streams furnish particularly interesting exposures, and are here described, although, like other sections just referred to, they lie outside the eastern margin of the Memoir-map.

The first of the streams just mentioned can be identified on Sheet 52 as entering Camas Fearna at its north-east angle near a cottage. In this stream the section is as follows:

	Feet	Inches
Tertiary Basalt Lavas	—	—
Purple mudstone	4	0
COAL – up to	2	0
Sandy fireclay	—	3
Moine Schist	—	—

The coal was discovered by a local resident during the winter of 1921. It is from 1.5 to 2 ft. thick, brown and of poor quality. It sometimes contains a large admixture of beautifully rounded quartz grains, together with chalk flints. The purple mudstone above the coal also includes similar quartz grains in its lower portion.

A search for fossils in the confused upper part of the coal deposit yielded a shark's tooth. This has been identified by Sir Arthur Smith Woodward as belonging to the genus *Oxyrhina*, probably *O. mantelli*, a species of late Cretaceous or early Tertiary age. Its association with the Chalk flints and rounded quartz grains makes it almost certain that it is *remanié* from a pre-existing Upper Cretaceous deposit. Otherwise one must admit a marine Tertiary fossil in the West Highlands where nothing of the kind has previously been discovered. The flints, it may be added, are full of foraminifera that can be seen in microscope slices.

It will be noticed that the conglomerate exposed farther north is absent in this coal-bearing section. It reappears in the next stream to the west, which also drains into Camas Fearna; but here the coal unfortunately is absent, so that the two rocks, coal and conglomerate, are never seen together:

	Feet
TERTIARY Lavas	—
TERTIARY Mudstone	3
?Tertiary or Trias Greyish-green conglomeratic sandstone	2
?Tertiary or Trias Conglomerate	3
Moine Schist	—

The pebbles in the conglomerate consist almost exclusively of well-rounded quartz, and range up to the size of a hen's egg. A few angular fragments of schist occur, but no flint could be found.

The more westerly of the streams entering Camas Ban gives a less complete exposure. Here, 2 ft. of creamy-white sandstone, with occasional pebbles, are capped by mudstone. The base unfortunately is hidden, and nothing more is seen till Moine Schist is reached a little downstream.

Mudstone is visible at low tide beneath the lavas in Camas Bàn. Moine Schist appears close at hand, but there was no continuous exposure at the time of the survey. J.B.S.