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## Chapter 27 Cambrian Area From Strath na Sheallag To Kishorn

By B. N. Peach and J. Horne, with notes by L. W. Hinxman and E. Greenly. The district described in this chapter is contained in Sheets 81, 82, 92, Geographical Survey Map of Scotland, on the scale of 1 inch to a mile (1:63360).

In the undisturbed area between Strath na Sheallag and Loch Maree, the Cambrian strata, ranging in places from the basal quartzite to the lowest members of the Durness dolomites, form a comparatively narrow belt resting on the Torridon Sandstone. In the northern part, especially between Sgùrr Bàn and Beinn a' Chlaidheimh, the discordance between the two formations is clearly displayed, bed after bed of the red sandstones being transgressed by the basal quartzites. South of Lochan Fada, however, where the observer follows a strike section for a distance of two miles, the unconformability is not very apparent, though the boundary between the two is distinctly traceable.

The members of the arenaceous series extend along the base of the eastern slope of the Loch an Nid valley, thence mounting the crests of Sgùrr Bàn and Mullach Coire Mhic Fearchair, they trend southwards to the moorland east of Lochan Fada. At that point the outcrops of the various zones are shifted southwestwards for about a mile and a half by the Fasagh fault. Beyond that lake to the Kinlochewe River they form a conspicuous crag beneath a broad mass of displaced Lewisian gneiss.

South of Loch Maree to Loch Kishorn the area occupied by unthrust members of this system is limited, as they are mostly affected by the post-Cambrian movements. But the quartzites are traceable continuously from the shore of Loch Maree through the Kinlochewe Forest to the magnificent escarpments on Ruadh-stac Mor, one of the western spurs of Beinn Eighe. Here also they rest unconformably on the Torridon Sandstone, though the discordance is not so apparent as in the Dundonnell Forest. In Glen Kishorn, the series up to the serpulite grit is seen in natural order between Rassal and Glaschnoc, but further north in the Achnashellach Forest the pipe-rock and basal quartzite soon participate in the movements.

The former extension westwards of the Cambrian strata is here indicated by conspicuous outliers of the arenaceous series at some distance from the outcrop of the main belt. For example, on Beinn a' Chlaidheimh (2750 feet), south of Strath na Sheallag, on Liathach (3456 feet), at the head of Loch Torridon, and on Beinn Damph (2958 feet), there are small patches of basal quartzite, and also, in the two latter instances, a portion of the lowest zone of the pipe-rock.

In this belt one exception has been found to the apparent absence of organic life in the lower division of the quartzites, for, on the crest of the ridge between Sgùrr Bàn and Beinn a' Chlaidheimh, on the west side of Loch an Nid valley, vertical worm-casts were detected in a band of quartzite belonging to this sub-division. Another slight departure from the normal type of sedimentation of the false-bedded grits occurs in the Beinn Eighe Forest, south of Kinlochewe, where a zone of grey shale, thirteen feet in thickness, occurs near the base of this subgroup. The overlying zone of pipe-rock, from 250 to 300 feet thick, displays in the Dundonnell Forest the five sub-zones met with in the Assynt district, and they have been traced southwards through the mountainous region south of Loch Maree to Kishorn.

The feature of special importance in the belt of undisturbed Cambrian strata between Strath na Sheallag and Kishorn is the exposures of fucoid-beds and serpulite grit, which have yielded an assemblage of organic remains characteristic of the lower division of that system. A glance at the geological map accompanying this Memoir will show that the fucoid-beds form a more or less continuous outcrop through the Dundonnell Forest to Loch Maree. The locality, where the trilobite-bearing band; in this zone were first observed, and where portions of *Olenellus* were first found by A. Macconochie, occurs in Allt Rìgh Iain — a small stream on the eastern side of Loch an Nid valley, and about three miles E.S.E. of Loch na Sheallag. At the point where the burn is crossed by the hill-road between Dundonnell and Achneigie, the upper portion of the fucoid-beds is exposed, containing two prominent bands of dark-blue shale, intercalated in the normal dolomitic beds of the zone. The upper band lies about three feet and the lower one about nine feet from the top of the fucoid-beds. The fragments of *Olenellus* were found in the lower band, the best specimens being confined to a seam less than an inch thick. Some of these dark-blue shales are slightly calcareous and are traversed by small worm-casts. It is highly probable that they are on the same horizon as the blue "piped" shales at the top of the section near Meall a'

Ghubhais, to which attention will be immediately directed. It is noteworthy, however, that the soft shale so highly fossiliferous south of Loch Maree has not been detected in Allt Righ Iain. <ref>The *Olenellus* Zone in the North-West Highlands of Scotland. by B. N. Peach and J. Horne. *Quart. Jour. Geol. Soc.*, vol. xlviii., p. 227.</ref>

The upper limit of the furoid-beds in this section is well defined, the base of the *Salterella* (serpulite) grit forming a small cascade over which the stream leaps on to the softer beds below. The higher portion is charged with *Salterella* in fine preservation.

Immediately to the north of Allt Righ Iain, several interesting stream-sections present excellent exposures of the *Olenellus* shales with the characteristic organisms. One of these streams (unnamed on the six-inch map) rises on the moory watershed between Allt Coire Chaorachain (draining into Strath Beg) and Strath na Sheallag. About a mile to the north of Allt Righ Iain it is crossed by the hill-road leading to Dundonnell, whence it flows southward for two-thirds of a mile, until joined by a small tributary (Allt a Chip). Here the main stream is deflected to the south-west, joining the Loch an Nid River near the mouth of Allt Righ Iain. In the sides of a small gorge in Allt a Chip an excellent section may be seen of the furoid-beds with the two bands of dark-blue shale near the top of the zone, separated by the normal dolomitic layers, the thickness of the upper zone being three feet and of the lower 19 inches. A layer of rusty dolomite, about a foot thick, overlying the lower band of dark-blue shale, was found to be crowded with excellent specimens of *Hyalithes* sp.

Again, in the main stream of which Allt a Chip is an affluent, both of the layers of dark-blue shale near the top of the zone are visible, the upper one cropping out at the base of a small waterfall formed by the overlying *Salterella*-grit, the latter being succeeded by black shaly limestone and dark mottled dolomite with seams charged with *Salterella*. These beds, which form the base of the Durness calcareous series, are abruptly truncated by a thrust to be referred to in the sequel. It is important to note that, in this last section, the brown dolomitic bands associated with the *Olenellus* shales contain serpulites (*Salterella*).

Further south, near Loch an Nid, fragments of trilobites were found in thin shales intercalated in the *Salterella*-grit. About 450 yards to the north of that lake, the following vertical section is exposed in an escarpment cut by a streamlet on the east side of the valley, beneath a mass of disrupted Lewisian gneiss:

	feet	inches	
	Grey quartzose grit	18	0
	Flaggy grits, with intercalated shales	7	0
	Grey shales	1	0
Zone of <i>Salterella</i> Grit	Dark blue shales containing <i>Olenellus</i>	0	8
	Grey grit	2	0
	Dark grey shales	1	6
	Grey quartzite	7	3
Top of Furoid Beds	Brown dolomitic shales with bands of dark shales	5	3

The dark-blue shales intercalated in the grits and quartzites have yielded a carapace of *Olenellus Lapworthi* and other fragments of this form. These shales are underlain by grey grits and quartzites forming the lower portion of the zone of the serpulite (*Salterella*) grit. When traced southwards along the hill-slope, the upper and lower ledges of quartzose grit coalesce and form a prominent escarpment overlying the furoid-beds. At certain localities along the base of the Loch an Nid crag, beneath the disrupted Lewisian gneiss and Torridon Sandstone, the undisturbed serpulite grit is overlain by the basal member of the Durness dolomite charged with *Salterella*.

By far the finest section of the trilobite-bearing bands of the furoid-beds occurs immediately to the south of Loch Maree, about a mile from the shore of that lake. <ref>Additions to the Fauna of the *Olenellus* Zone of the North-West Highlands, by B. N. Peach, *ibid.*, vol. 1., p. 661.</ref> On the northern slopes of Meall a' Ghubhais (2882 feet) — a conspicuous hill (three miles W.N.W. of Kinlochewe) formed of an outlying mass of displaced Torridon Sandstone — a streamlet rises

near Loch na Mna' Bige in the thrust materials, and exposes the underlying undisturbed Cambrian strata from the serpulite grit to the basal quartzite. The fucoid-beds are seen on the west bank at the point where the 1250-foot contour-line crosses the burn, and where their outcrop is shifted by a small fault with a downthrow to the south-east. Though not far beneath the plane of the Kinlochewe thrust, the beds are not deformed nor are the fossils distorted. The various fossiliferous sub-divisions, which have been carefully worked by A. Macconochie, are given below in descending order:

	feet	inches
Serpulite grit		
7. Blue clayey and sandy shale full of small vertical wormcasts yielding occasional fragments of <i>Olenellus gigas</i> and <i>Olenellus Lapworthi</i>	18	0
6. Shale with well-preserved brachiopods ( <i>Acrothele subsidua</i> )	0	9
5. Dark flaggy or platy shale, with fragments of <i>Olenellus</i> at base	2	10
4. Ferruginous yellow dolomitic band, with conchoidal fracture	0	7
3. Pisolitic ironstone with remains of trilobites and echinoderms	0	2
2. Hard ferruginous dolomitic band, the bottom film crowded with carapaces of <i>Olenellus</i>	0	3½
1. Soft, jointed, cleaved clayey shale. The topmost seams yield occasional complete specimens of <i>Olenellus</i> and fine examples of <i>Olenelloides armatus</i> ; the lowest two inches are crowded with disjointed and broken segments of <i>Olenellus</i> . This band of shale is termed the <i>Olenellus</i> layer	0	11

Dolomitic fucoid-beds are seen in stream further down. As the foregoing section illustrates the typical development of the trilobite-bearing bands in the fucoid-beds in the North-West Highlands, it may serve a useful purpose to indicate the sub-zones which are represented beyond the limits of the Loch Margie area. The peculiar soft cream-coloured shale, blue in fresh fracture, which, from the abundance of the zonal form in certain thin films, has been termed the *Olenellus* layer, has been noted in the far north at An t-Sron on the east shore of Loch Eireboll, on the north side of Loch Assynt near Skiag Bridge (two miles N.N.W. of Inchnadamff), on the north shore of Loch Broom, and also in Skye, in the Tokavaig Burn south of the Ord. At each of these localities specimens of the characteristic zonal form have been obtained, and at the last of these exposures in Skye examples of *Olenelloides armatus* have also been recorded. One noticeable feature is the absence or the limited development of the blue "piped" shale (Sub-zone 7 in the Meall a' Ghubhais sequence) in the various sections beyond the Loch Maree area.

The peculiar band of pisolitic ironstone with fragments of trilobites and echinoderms has likewise a wide distribution, for it has been noted by the side of the shepherd's footpath on the south side of Loch Glencoul, by the Knockan Cliff near the southern border of Assynt, and again in the Achnashellach deer forest between Kinlochewe and Glen Carron.

In all the sections referred to above, the fragments of *Olenellus* have been found either in the *Olenellus* layer (Sub-zone 1, Meall Ghubhais section) or in bands overlying that horizon, but at one locality along the line between Eireboll and Skye they have been noted below that stratigraphical position. In the Ullapool River a carapace of *O. Lapworthi* was obtained in a thin seam of grey shale interleaved in flaggy dolomitic beds, presenting the normal characters of the lower portion of the zone. It is worthy of note also that, in most sections, the sandy dolomites beneath the *Olenellus* layer contain

*Salterella* and *Hyolithes*.

The distribution of the Cambrian strata in the displaced masses between Strath na Sheallag and Kishorn is extremely irregular. In the Dundonnell Forest and southwards to the Heights of Kinlochewe they appear as thin lenticles traceable for no great distance. Beyond that locality, in the lower part of Glen Bruachaig, the folded and thrust zones of the pipe-rock and furoid-beds, rising from underneath the mass of Lewisian gneiss that overlies the Kinlochewe thrust-plane, are well displayed on the west side of the valley, and the fossiliferous zones are not much deformed. In particular, the cleaved furoid-beds visible in the channel and on the banks of that stream about a mile and a half below the Heights of Kinlochewe contain the pisolitic ironstone band and the soft shale beneath, from which carapaces of *O. Lapworthi* and *Hyolithes* have been obtained. Again, among the materials above the Kinlochewe thrust-plane, striking evidence has survived of the double unconformability of the basal quartzite on the Torridon Sandstone and Lewisian gneiss.

South of the Kinlochewe River, on Beinn Eighe, the Cambrian strata, repeated by numerous folds and thrusts, cover a belt of ground about three miles broad (Part 4, Chapter 37). Beyond that locality, from the head of Glen Torridon southwards by Beinn Liath Mhor towards An Ruadh-stac, they appear as long parallel strips amid intervening belts of Torridon Sandstone, which furnish impressive testimony of the extensive folding, thrusting, and denudation of the strata. (See Geological Map)

Along the eastern margin of the Coulin and Achnashellach deer forests, from Loch Clair to Achnashellach Station, thence by the hill-slopes on the west side of Glen Carron to Glen Kishorn, the quartzites, furoid-beds, and serpulite-grit can be traced more or less continuously to the west of the outcrop of the Kinlochewe and Kishorn thrust-plane. In Allt nan Dearcaig, about a mile and a half to the north of Achnashellach Station, the band of pisolitic ironstone is well seen in the exposure of furoid-beds. Towards the southern part of this belt, in Glen Kishorn and along the north-west slope of Sgorr a' Gharaidh, there is a prominent development of the two lowest zones of the Durness dolomites and limestones.