
Figures

(Front cover) Front cover.

(Frontispiece 1) Border region and the location of the excursions.

(Frontispiece 2) Geological column, timescale after Harland (1989).

(Figure 1) Southern Upland geological map.

(Figure 2) Southern Uplands: structural development.

(Figure 3) Southern Uplands: biostratigraphy.

(Figure 4) a. *Didymograptus superstes* Lapworth b. *Climacograptus bicornis* (Hall) c. *Hallograptus mucronatus* (Hall) d. *Nernagraptus gracilis* (Hall) e. *Corynoides calicularis* Nicholson f. *Neurograptus margaritatus* (Lapworth) g. *Dicellograptus patulosus* Lapworth h. *Dicranograptus nicholsoni* Hopkinson i. *Climacograptus tubuliferus* Lapworth j. *Orthograptus calcaratus basilicus* Elles & Wood k. *Dicellograptus morrisi* Hopkinson l. *Dicranograptus clingani* (Carruthers) m. *Orthograptus abbreviatus* Elles & Wood n. *Dicellograptus anceps* (Nicholson)

(Figure 5) Some Silurian graptolites. Examples of Silurian graptolites that may be found in the Birkhill Shales and Gala Group, arranged roughly in order of age, the youngest at the top of the page, and numbered in ascending order. All about twice natural size. a. *Parakidograptus acutinatus* (Nicholson) b. *Climacograptus (Normalograptus) normalis* Lapworth c. *Dimorphograptus swanstoni* Lapworth d. *Rhaphidograptus extenuatus* (Lapworth) e. *Atavograptus atavus* (Jones) f. *Monograptus triangulatus* (Harkness) g. *Coronograptus gregarius* (Lapworth) h. *Monograptus argenteus* (Nicholson) i. *Monograptus lobiferus* (McCoy) j. *Petalograptus ovatoelongatus* (Kurck) k. *Glyptograptus tantariscus* (Nicholson) l. *Monograptus convolutus* (Hisinger) m. *Monograptus sedgwickii* (Portlock) n. *Monograptus decipiens* (Törnquist) o. *Monograptus turriculatus* (Barrande) p. *Monograptus crispus* Lapworth q. *Monoclimacis griestoniensis* (Nichol)

(Figure 6) Siccar Point excursion.

(Figure 7) Fast Castle excursion.

(Figure 8) St Abb's Head excursion.

(Figure 9) Coldingham excursion.

(Figure 10) Eyemouth excursion.

(Figure 11) Burnmouth.

(Figure 12) (Figure 12) Carboniferous fossils. a. *Schizodus axiformis* (Phillips) $\times 0.7$ Visean b. *Canobius ramsayi* Traquair [after Traquair] $\times 1$; Visean c. *Sphenopteris affinis* (Lindley Sr Hutton) $\times 0.4$; Tournaisian-Visean d. *Lingula mytilloides* Sowerby $\times 2.5$; Visean-Westphalian e. *Woodocrinus liddesdalensis* J. Wright $\times 0.7$; Visean f. *Siphonodendron junceum* (Fleming) $\times 1$; Visean g. *Punctospirifer scabricosta* North $\times 3.3$; Visean.

(Figure 13) Lamberton.

(Figure 14) Spittal foreshore north part.

(Figure 15) Spittal foreshore central part.

(Figure 16) Spittal foreshore, south part.

(Figure 17) Folds in the Eelwell Limestone.

(Figure 18) Berwick Foreshore.

(Figure 19) Whiteadder Water excursion.

(Figure 20) Bedshiel.

(Figure 21) Raecleuch Head

(Figure 22) Jedburgh–Melrose–Kelso.

(Figure 23) Hutton's unconformity at Jedburgh.

(Figure 24) Border Abbeys excursion.

(Figure 25) Dryburgh Abbey.

(Figure 26) Melrose Abbey.

(Figure 27) Chiefswood.

(Figure 28) Eildon Hills excursion.

(Figure 29) Heriot and Innerleithen excursion.

(Figure 30) Broadlaw.

(Figure 31) Noblehouse, Lamancha excursion.

(Figure 32) Pillow lavas.

(Figure 33) Carlops.

(Figure 34) Dolphinton.

(Figure 35) Tweedsmuir excursion.

(Figure 36) Wrae Limestone Quarries.

(Figure 37) Cramalt road section, Megget.

(Figure 38) Structural problem, Cappercleuch Quarry.

(Figure 39) Hawick road section, Tushielaw.

(Figure 40) The *anceps* bands and Ordovician/Silurian boundary stratotype in Linn Branch trench (modified after Williams 1983).

(Figure 41) Biostratigraphical distribution of metabentonite horizons at Dob's Linn and amounts and proportion of metabentonite in graptolitic zones.

(Figure 42) Panoramic view of North Cliff from locality 15.

(Figure 43) Hartfell Score excursion.

(Figure 44) View of Hartfell Score.

(Figure 45) Main cliff, Hartfell Score.

(Figure 46) Kilbucho.

(Figure 47) Wandel Water.

(Figure 48) Upper Hawkwood Burn.

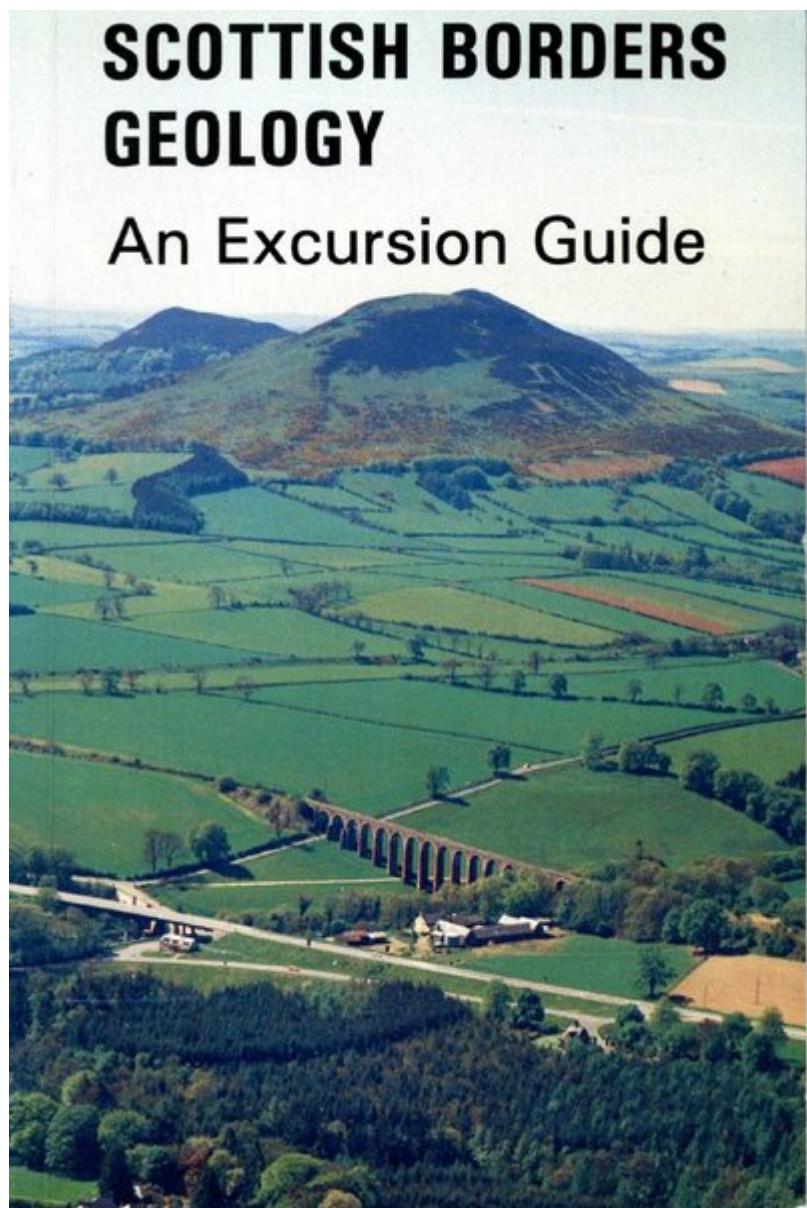
(Figure 49) Leadhills and Wanlockhead excursion.

(Plate 1) Geological map of the Scottish Borders area.

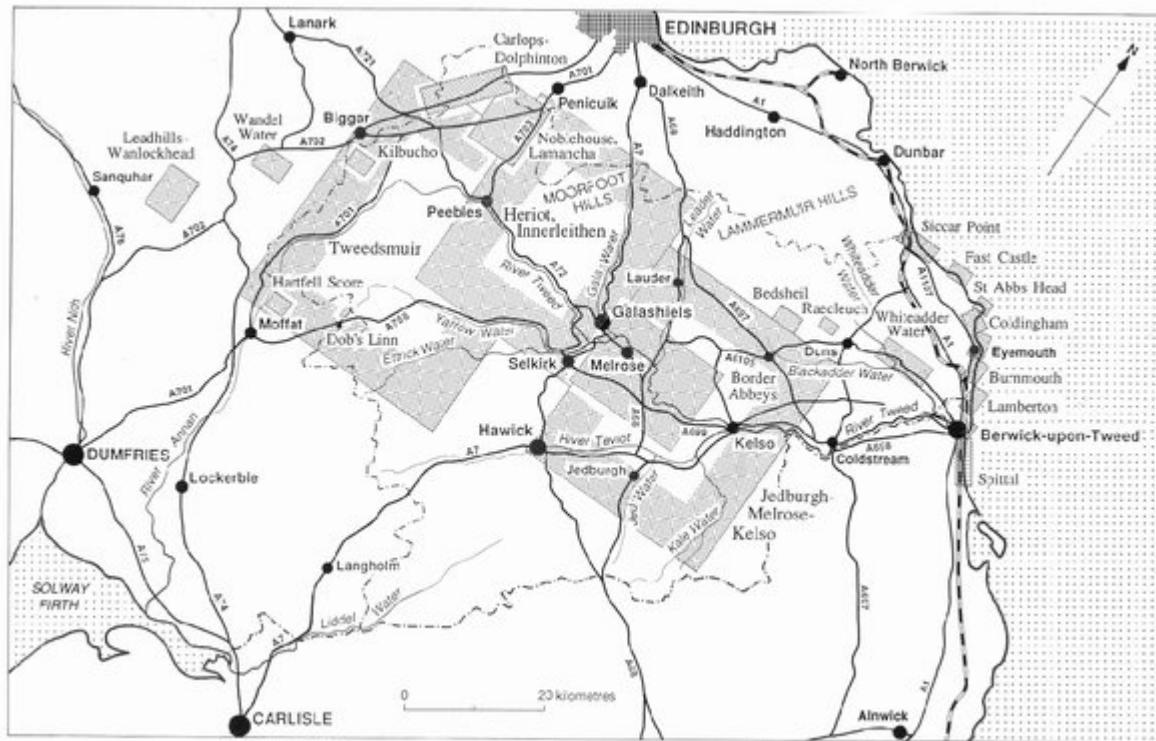
(Plate 2) Overhead view of Dob's Linn.

(Plate 3) Map of Dob's Linn area. Geological column, timescale after Harland (1989).

References



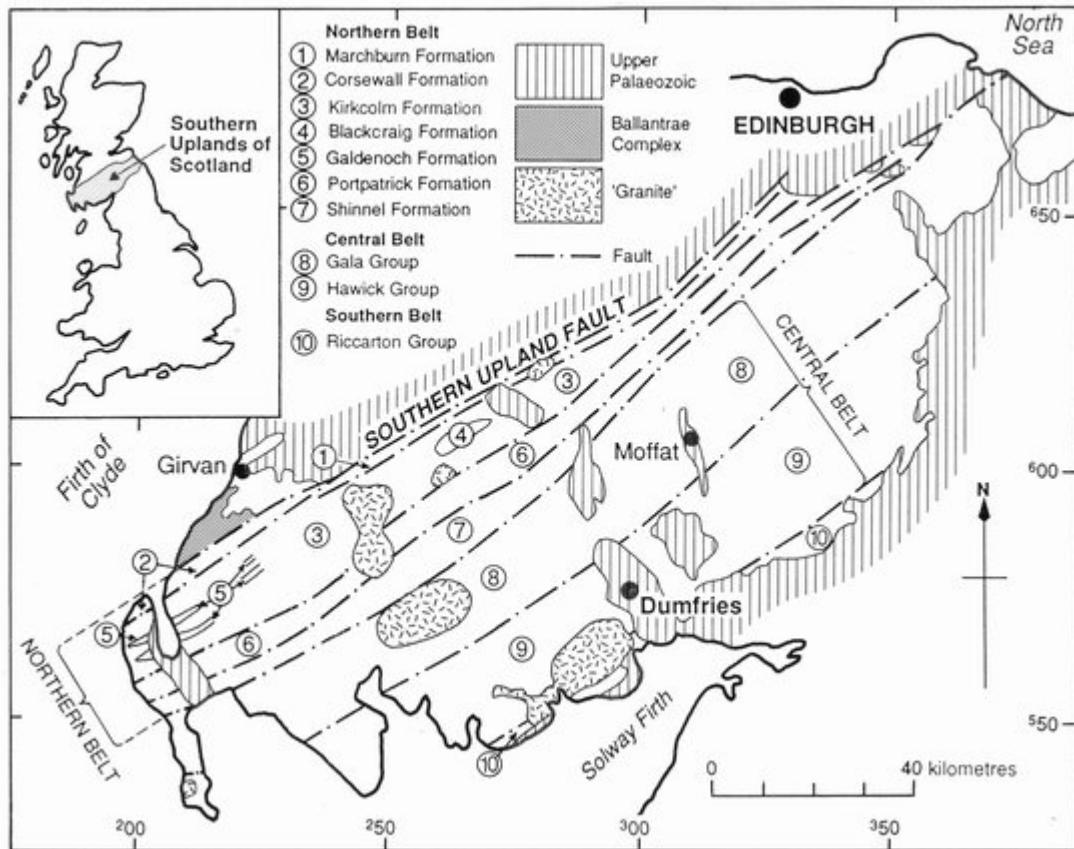
(Front cover) Front cover.



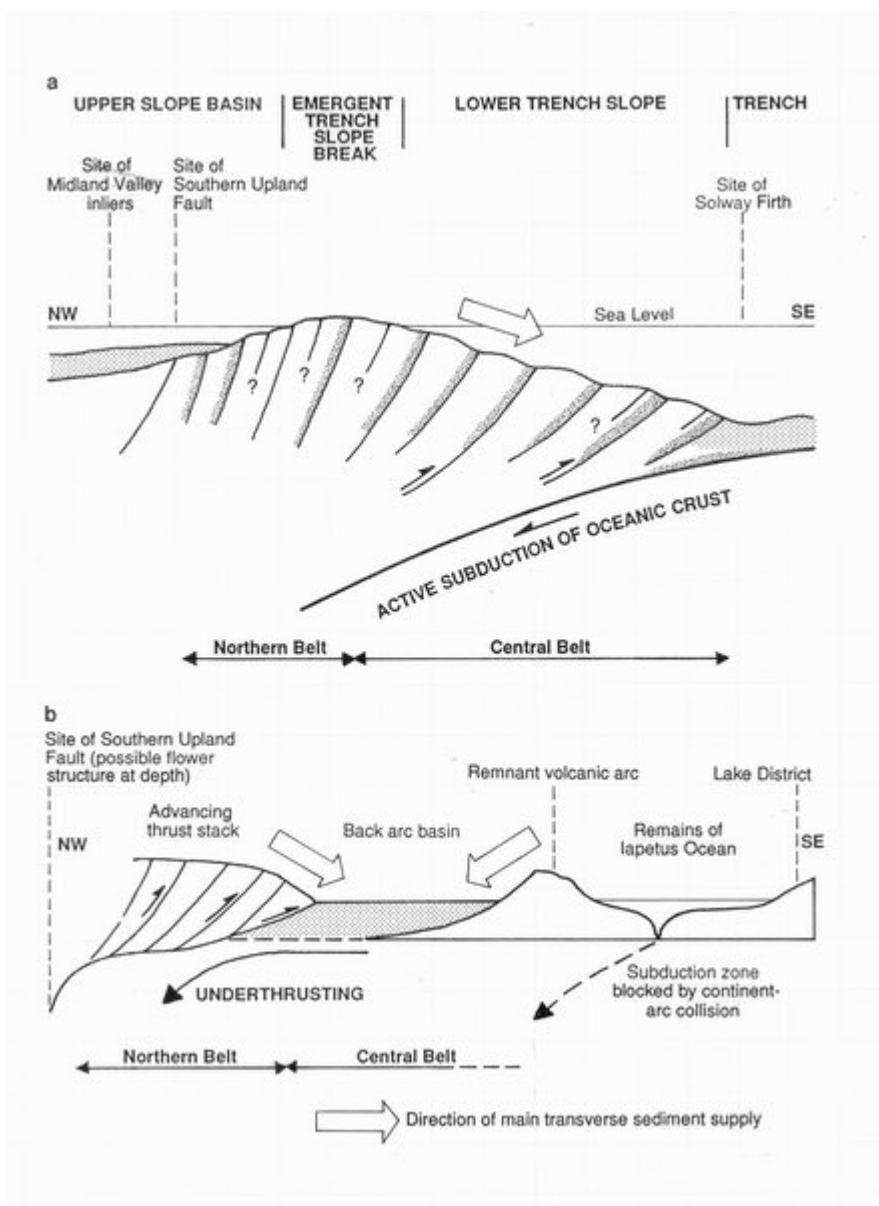
(Frontispiece 1) Border region and the location of the excursions.

| Era | Age in m.y. | Period System | Age Stage | Orogenic episode |
|--|-------------|---------------|---|--|
| C A E N O Z O I C | | QUATERNARY | Flandrian Devensian other | A L P I N E |
| | 2 | | | |
| | | TERTIARY | | |
| | 65 | | | |
| | | CRETACEOUS | | |
| | 144 | | | |
| | | JURASSIC | | |
| | 213 | | | |
| | | TRIASSIC | | |
| | 248 | | | |
| P A L A E O Z O I C | | PERMIAN | | H E R C Y N I A N |
| | 286 | | | A C A D I A N |
| | | CARBONIFEROUS | Stephanian Westphalian Namurian Visean Tournasian | |
| | 360 | | Upper Middle Lower | C A L E D O N I A N |
| | | DEVONIAN | Pridoli Ludlow Wenlock Llandovery | |
| | 408 | | | |
| | | SILURIAN | Ashgill Caradoc Llandeilo Llanvirn Arenig Tremadoc | |
| | 438 | | | |
| | | ORDOVICIAN | | |
| | 505 | | | |
| | | CAMBRIAN | | |
| | 590 | | PRE-CAMBRIAN | |

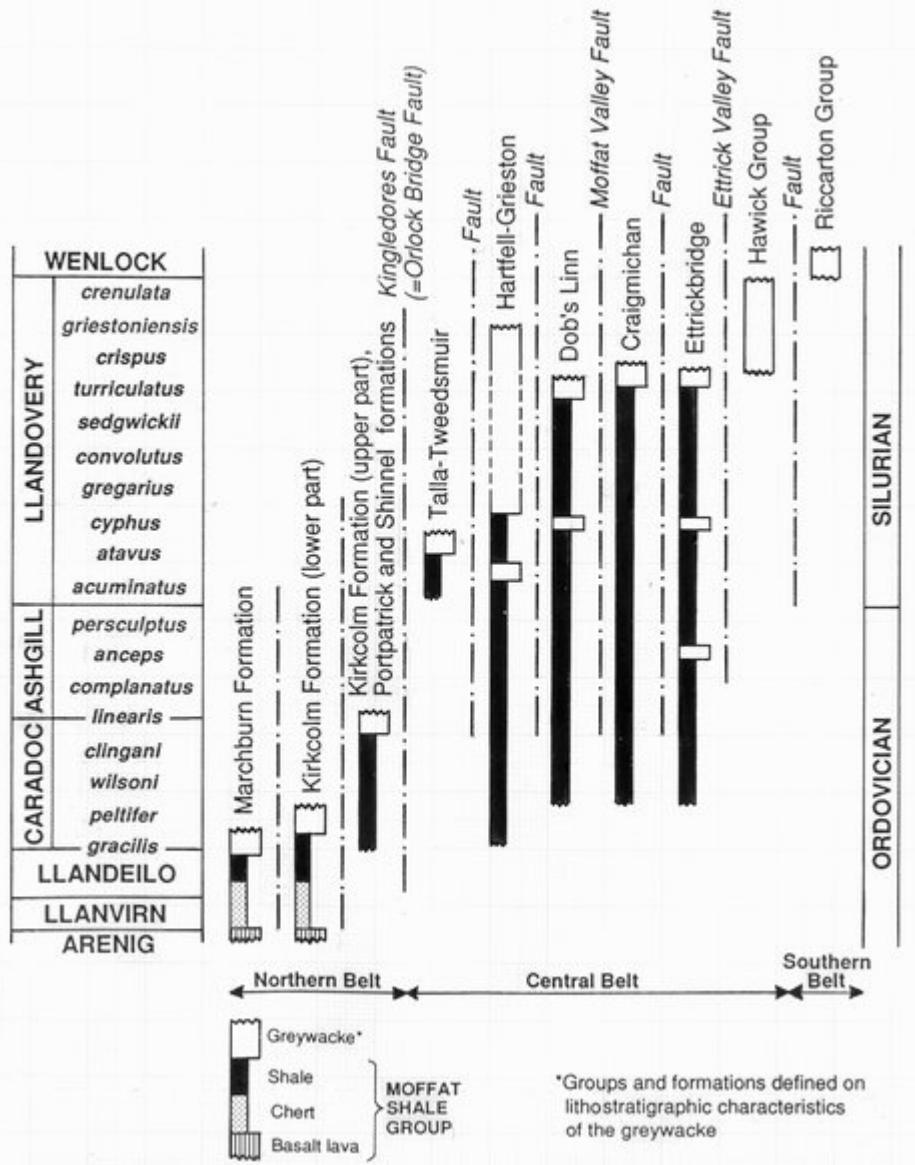
(Frontispiece 2) Geological column, timescale after Harland (1989).



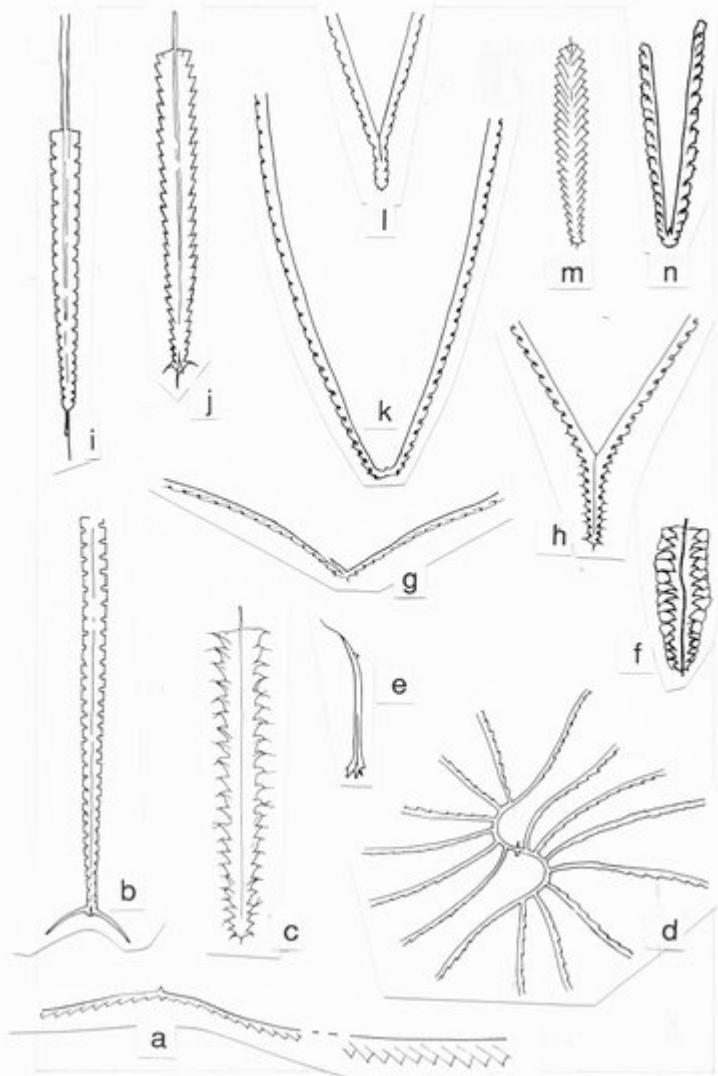
(Figure 1) Southern Upland geological map.



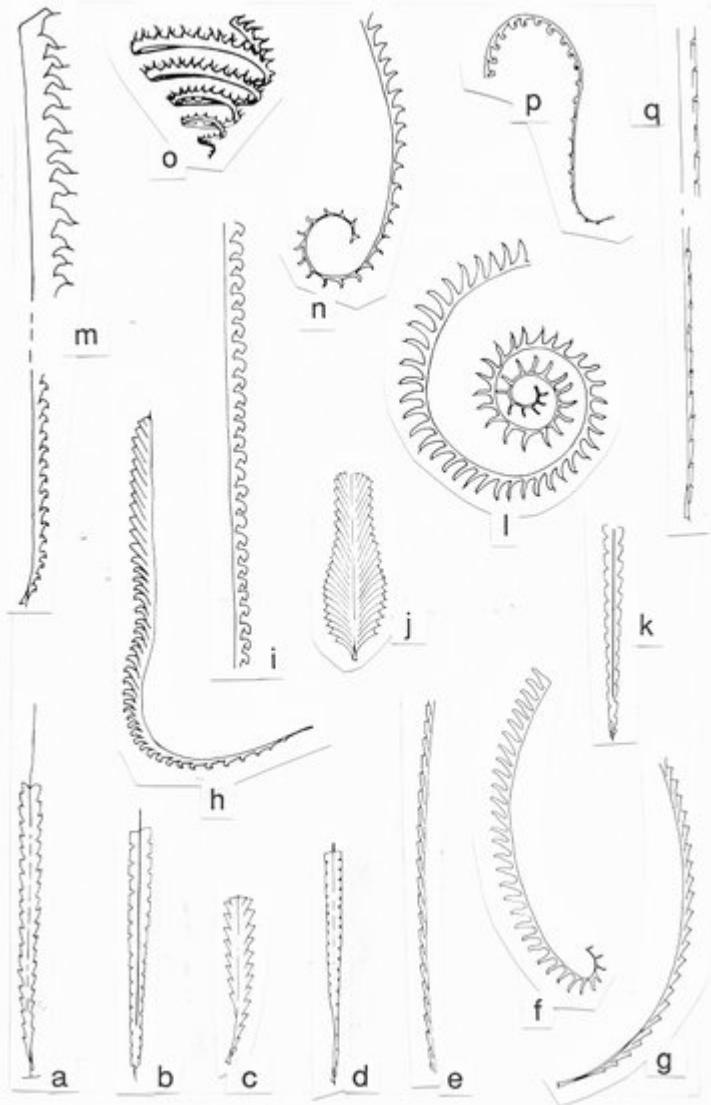
(Figure 2) Southern Uplands: structural development.



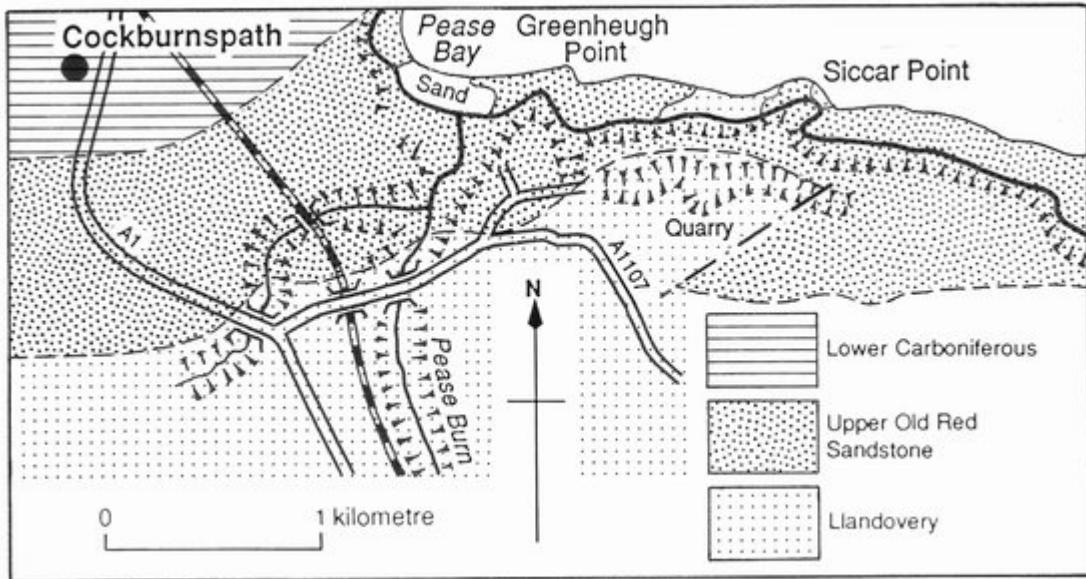
(Figure 3) Southern Uplands:biostratigraphy.



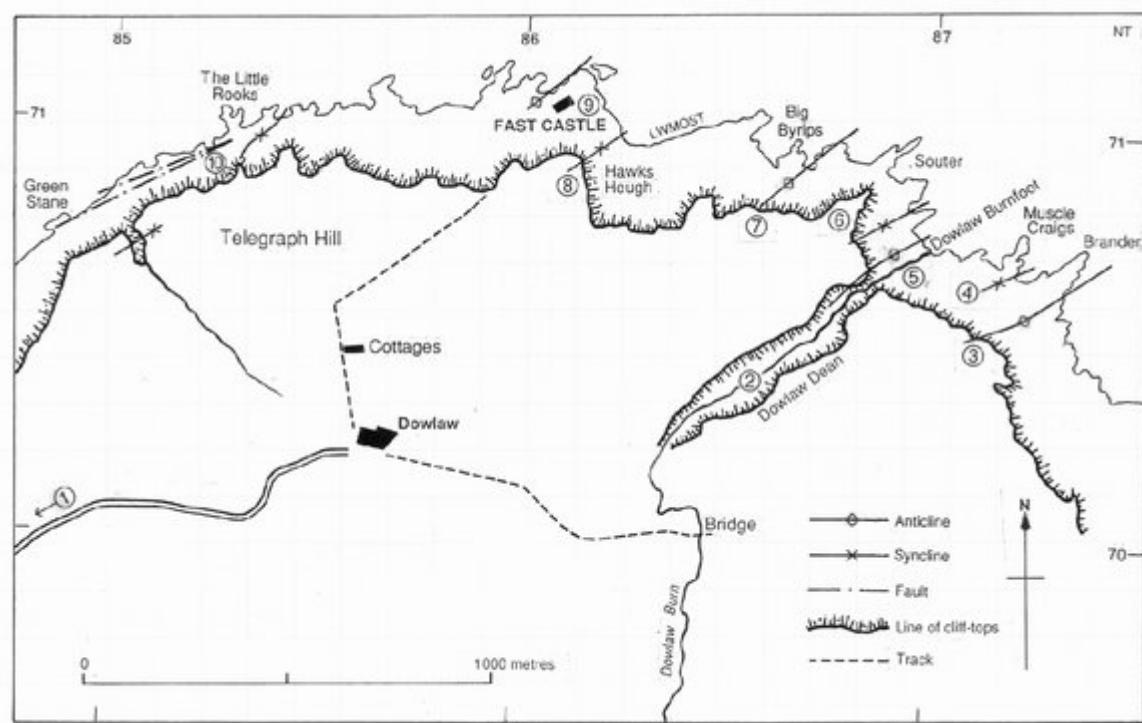
(Figure 4) a. *Didymograptus superstes* Lapworth b. *Climacograptus bicornis* (Hall) c. *Hallograptus mucronatus* (Hall) d. *Nernagraptus gracilis* (Hall) e. *Corynoides calicularis* Nicholson f. *Neurograptus margaritatus* (Lapworth) g. *Dicellograptus patulosus* Lapworth h. *Dicranograptus nicholsoni* Hopkinson i. *Climacograptus tubuliferus* Lapworth j. *Orthograptus calcaratus basilicus* Elles & Wood k. *Dicellograptus morrisi* Hopkinson l. *Dicranograptus clingani* (Carruthers) m. *Orthograptus abbreviatus* Elles & Wood n. *Dicellograptus anceps* (Nicholson)



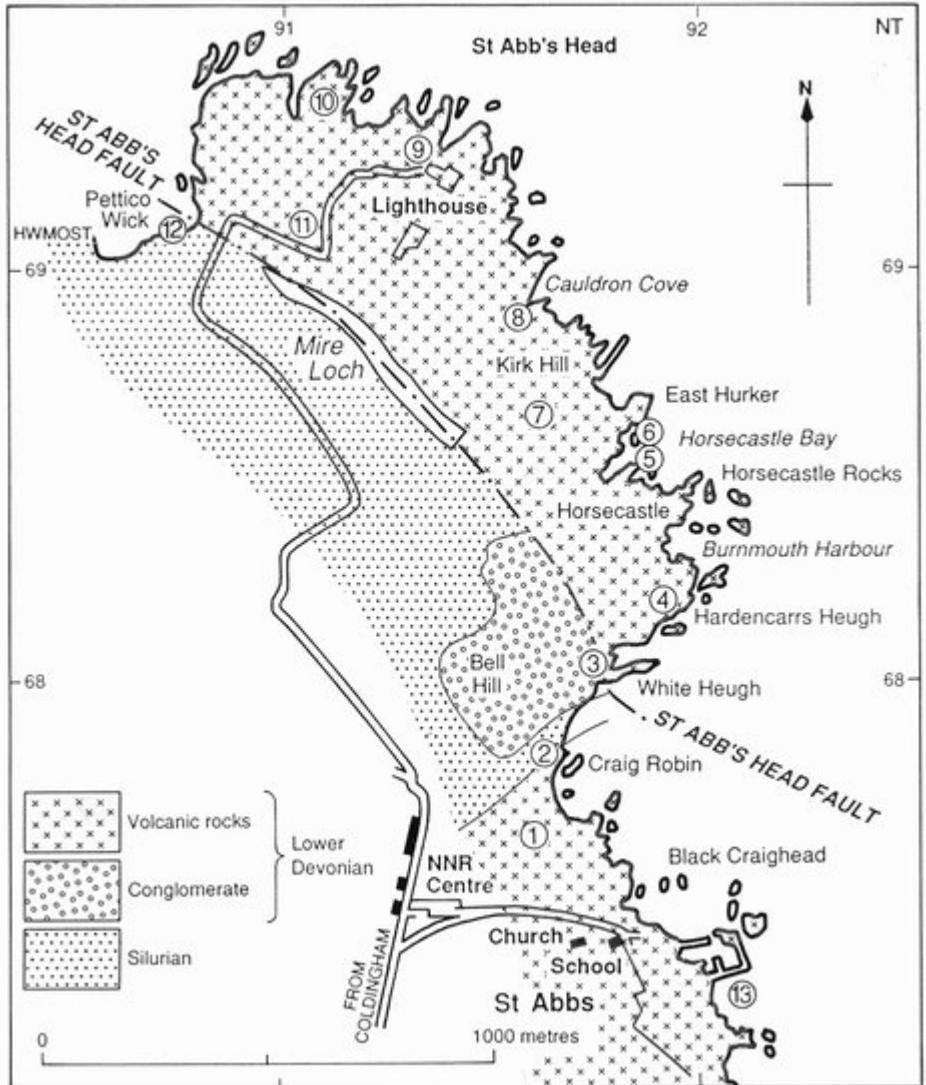
(Figure 5) Some Silurian graptolites. Examples of Silurian graptolites that may be found in the Birkhill Shales and Gala Group, arranged roughly in order of age, the youngest at the top of the page, and numbered in ascending order. All about twice natural size. a. *Parakidograptus acutinatus* (Nicholson) b. *Climacograptus* (*Normalograptus*) *normalis* Lapworth c. *Dimorphograptus swanstoni* Lapworth d. *Rhaphidograptus extenuatus* (Lapworth) e. *Atavograptus atavus* (Jones) f. *Monograptus triangulatus* (Harkness) g. *Coronograptus gregarius* (Lapworth) h. *Monograptus argenteus* (Nicholson) i. *Monograptus lobiferus* (McCoy) j. *Petalograptus ovatoelongatus* (Kurck) k. *Glyptograptus tantariscus* (Nicholson) l. *Monograptus convolutus* (Hisinger) m. *Monograptus sedgwickii* (Portlock) n. *Monograptus decipiens* (Törnquist) o. *Monograptus turriculatus* (Barrande) p. *Monograptus crispus* Lapworth q. *Monoclimacis griesoniensis* (Nichol)



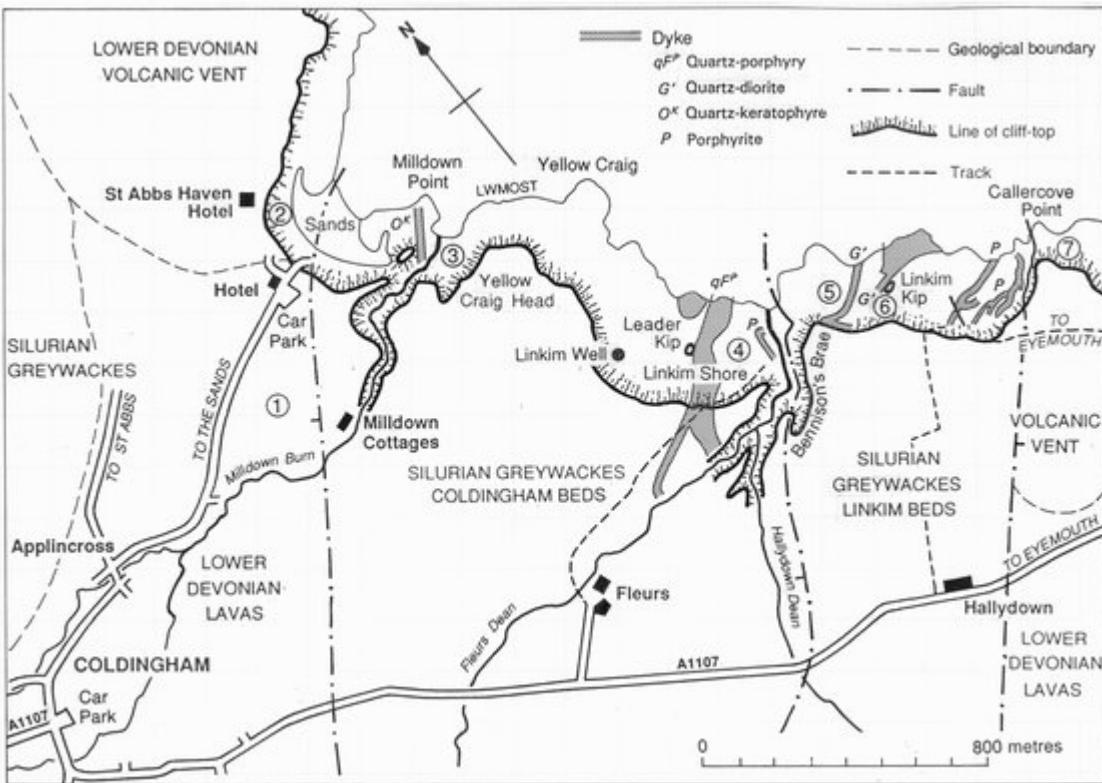
(Figure 6) Siccar Point excursion.



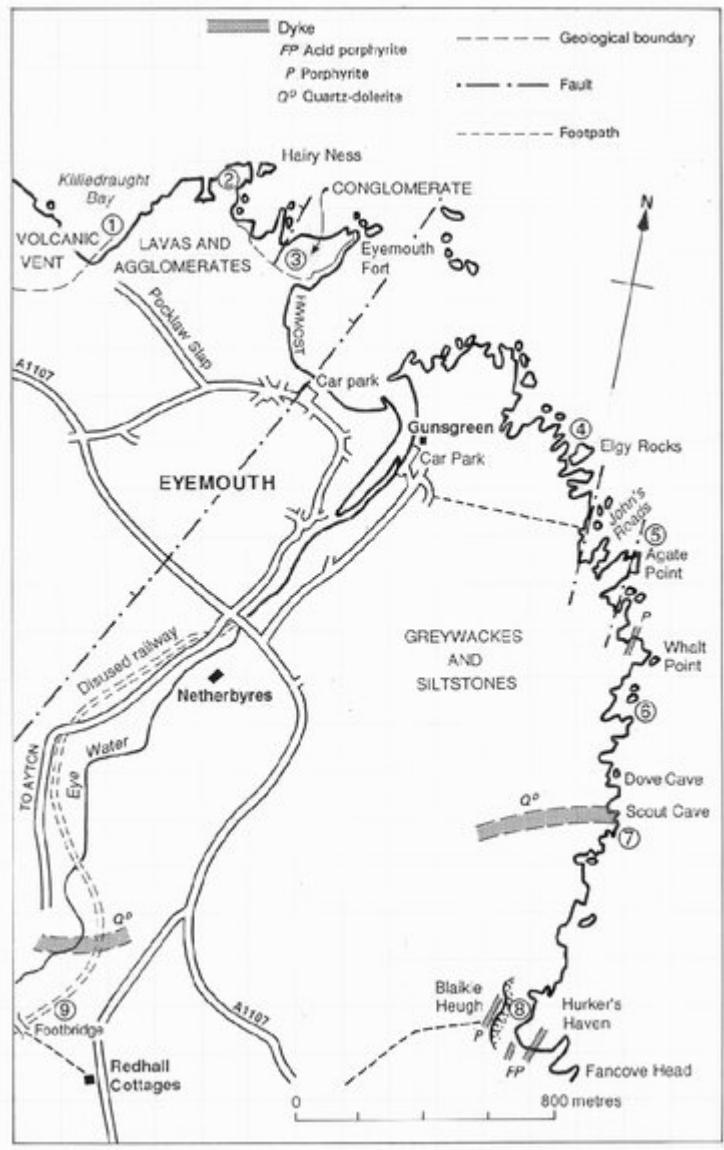
(Figure 7) Fast Castle excursion.



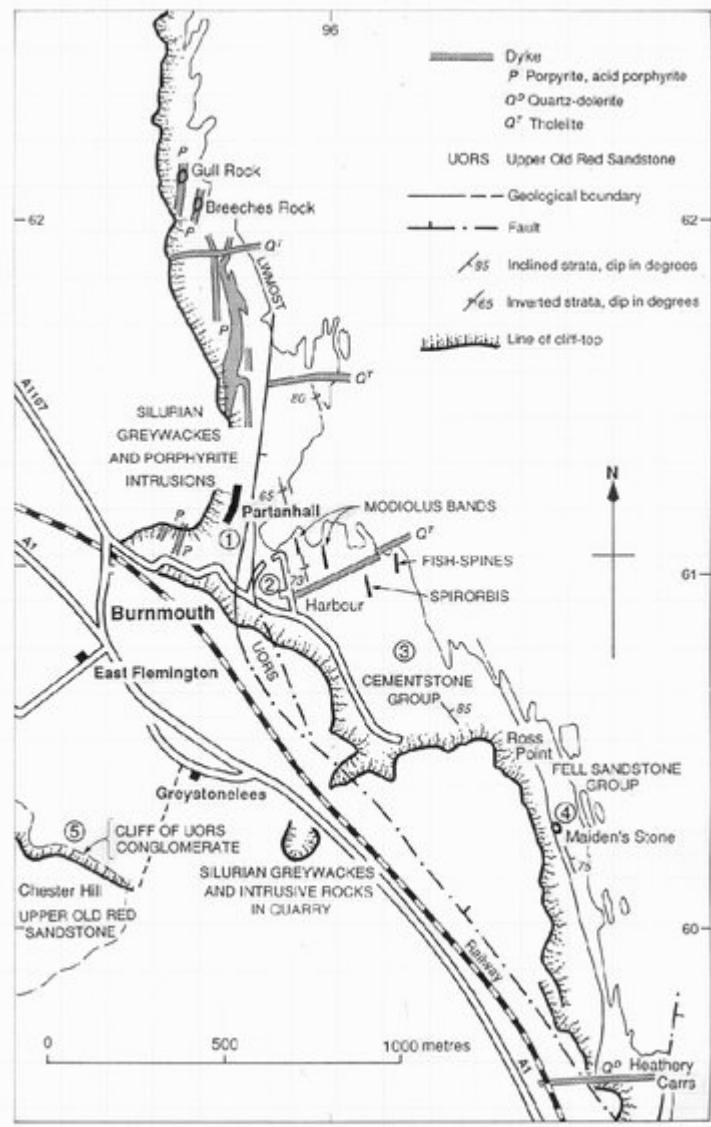
(Figure 8) St Abb's Head excursion.



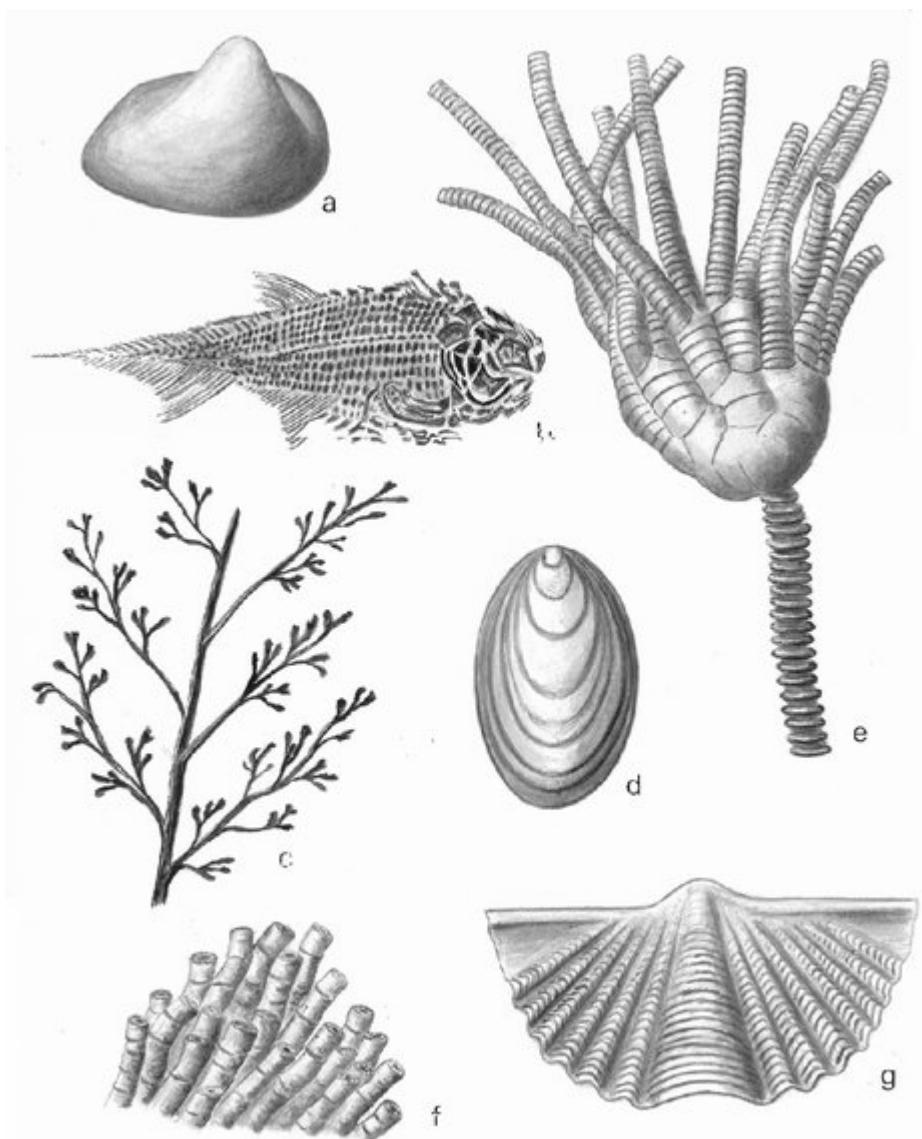
(Figure 9) Coldingham excursion.



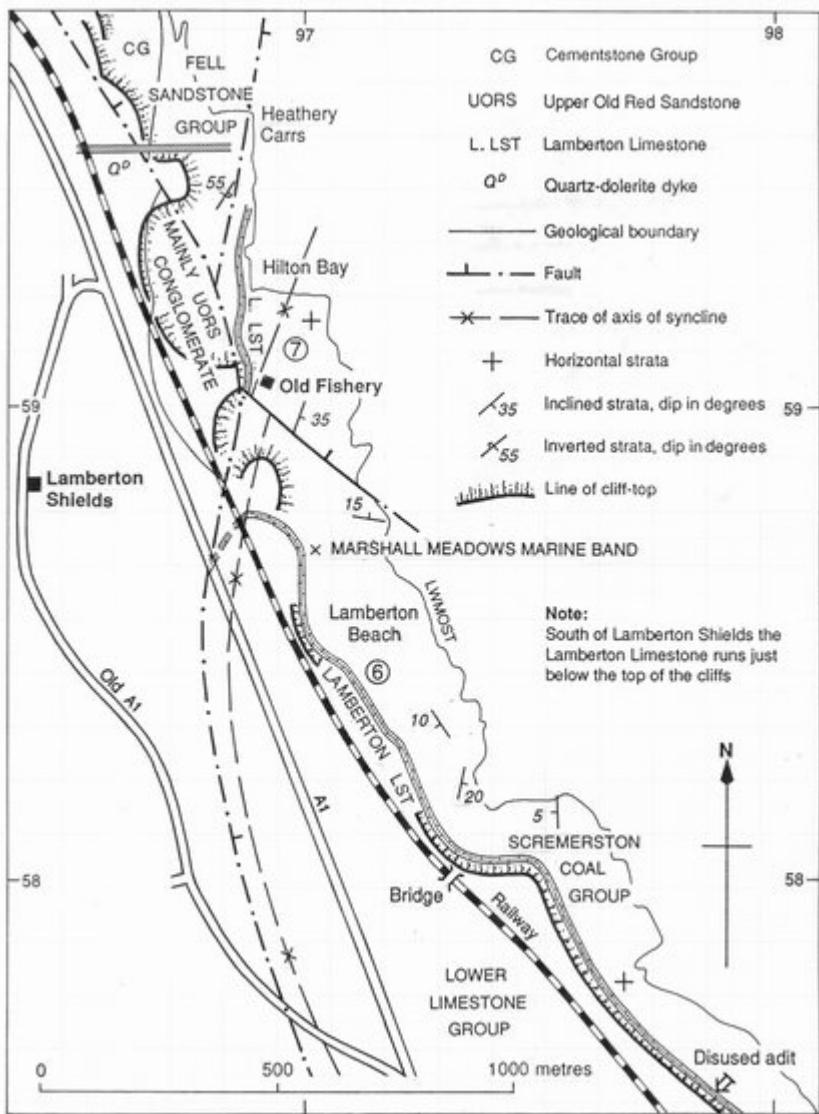
(Figure 10) Eyemouth excursion.



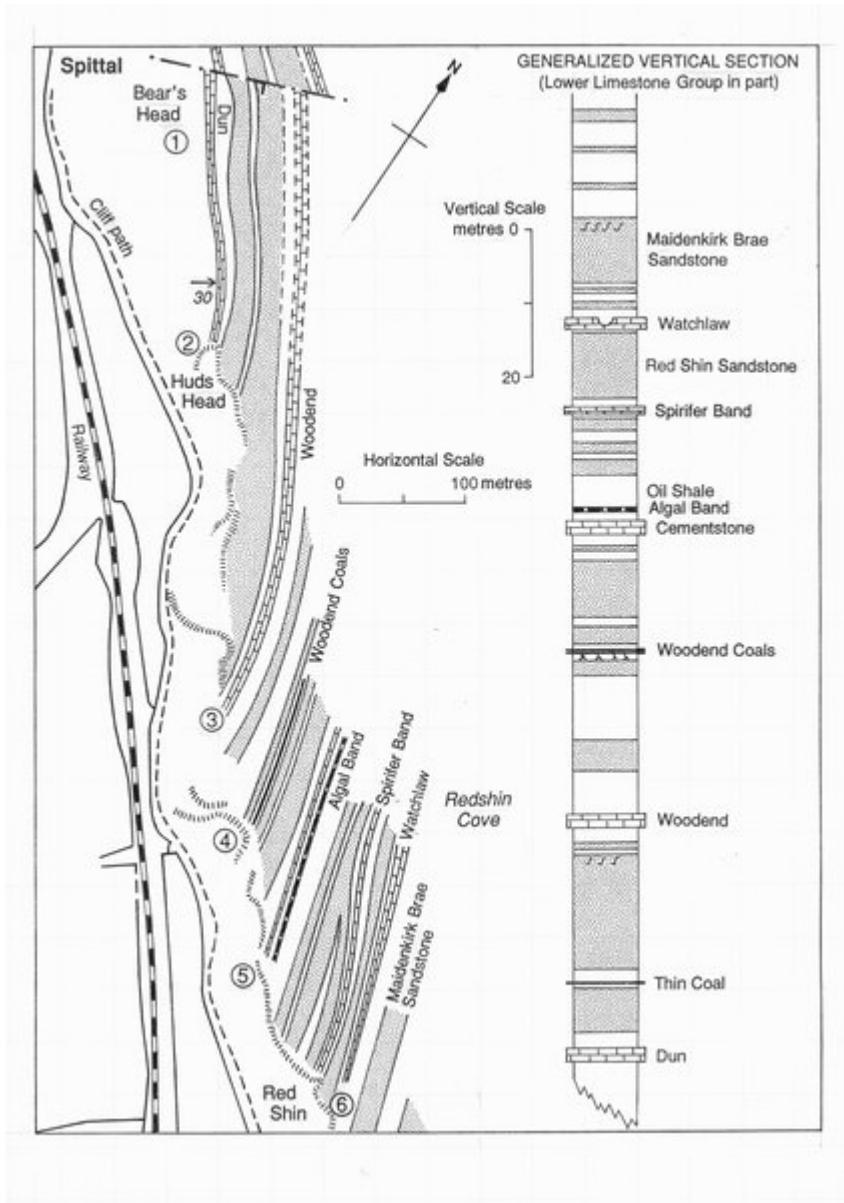
(Figure 11) Burnmouth.



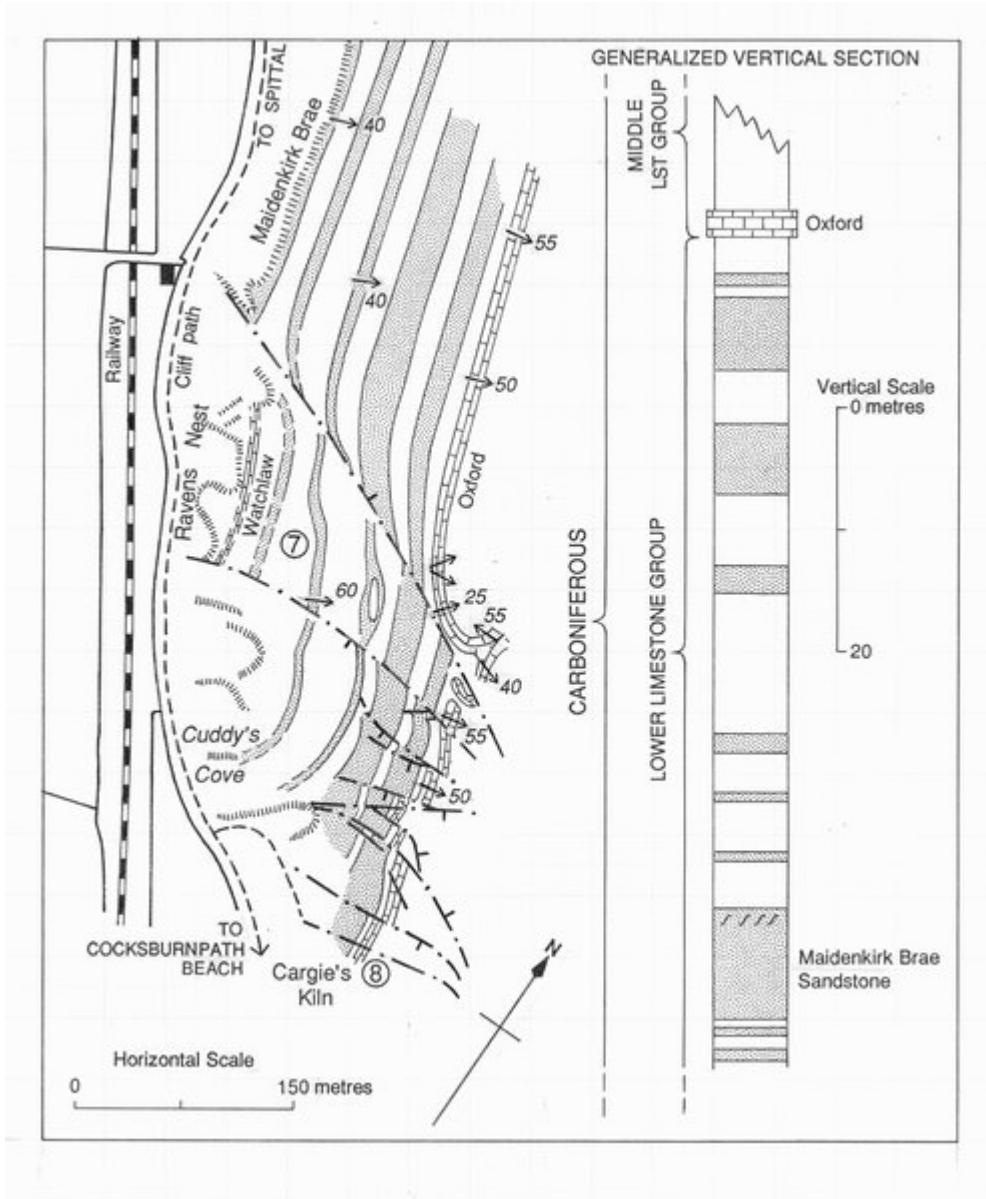
(Figure 12) Carboniferous fossils. a. *Schizodus axiformis* (Phillips) $\times 0.7$ Visean b. *Canobius ramsayi* Traquair [after Traquair] $\times 1$; Visean c. *Sphenopteris affinis* (Lindley Sr Hutton) $\times 0.4$; Tournaisian-Visean d. *Lingula mytiloides* Sowerby $\times 2.5$; Visean-Westphalian e. *Woodocrinus liddesdalensis* J. Wright $\times 0.7$; Visean f. *Siphonodendron junceum* (Fleming) $\times 1$; Visean g. *Punctospirifer scabricosta* North $\times 3.3$; Visean.



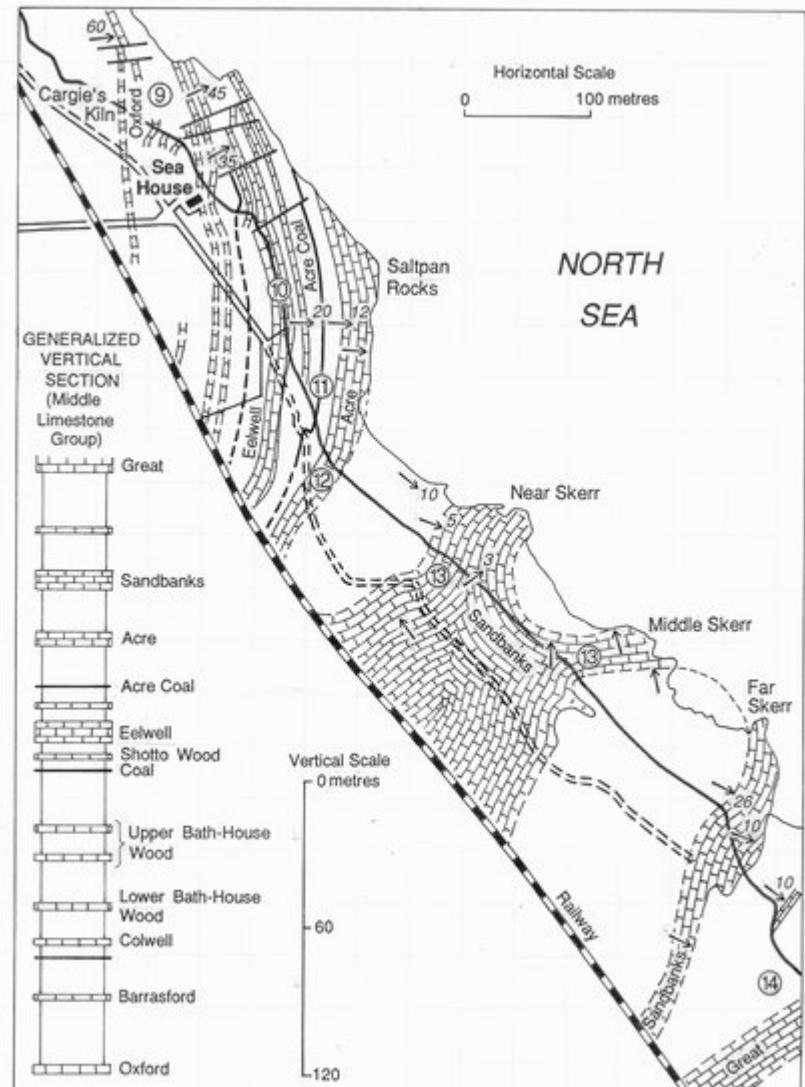
(Figure 13) Lamberton.



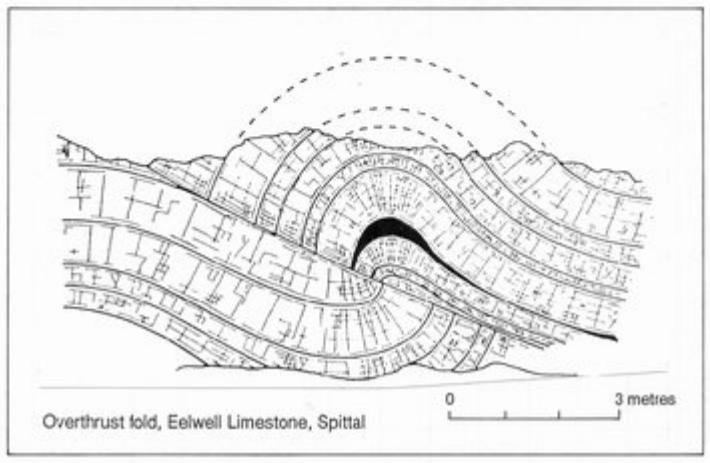
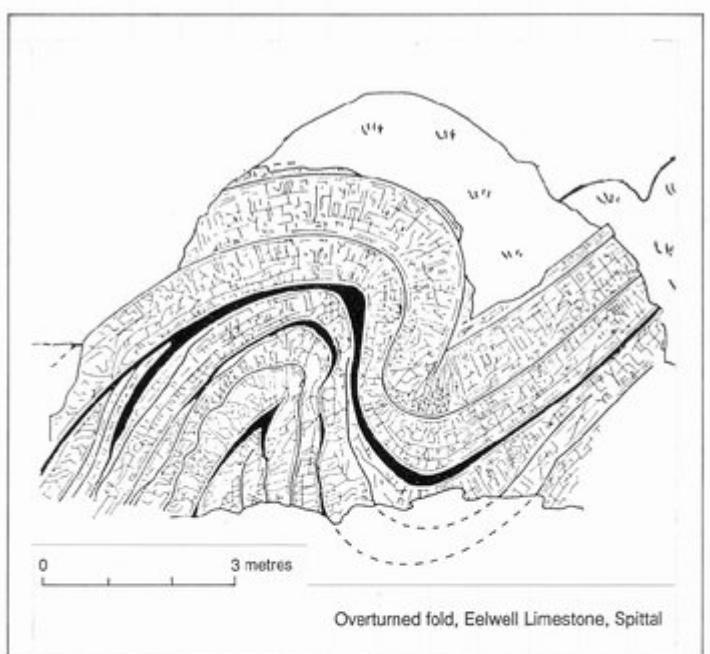
(Figure 14) Spittal foreshore north part.



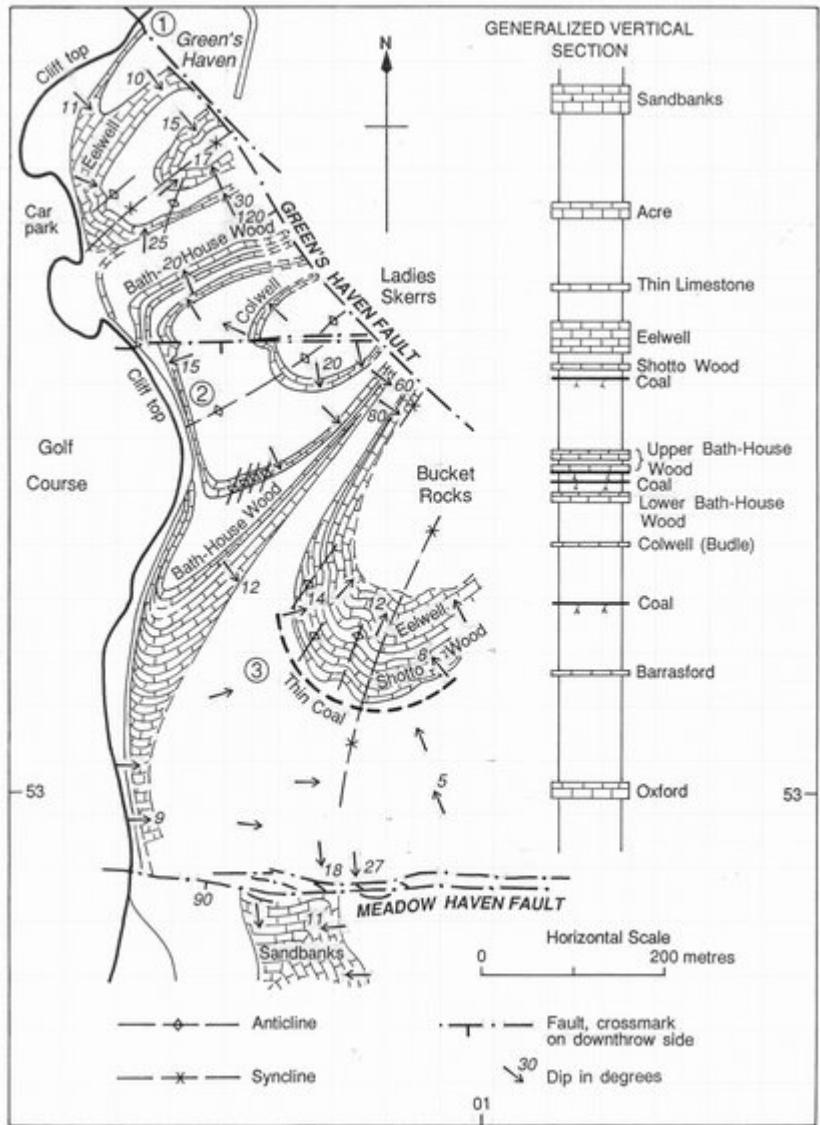
(Figure 15) Spittal foreshore central part.



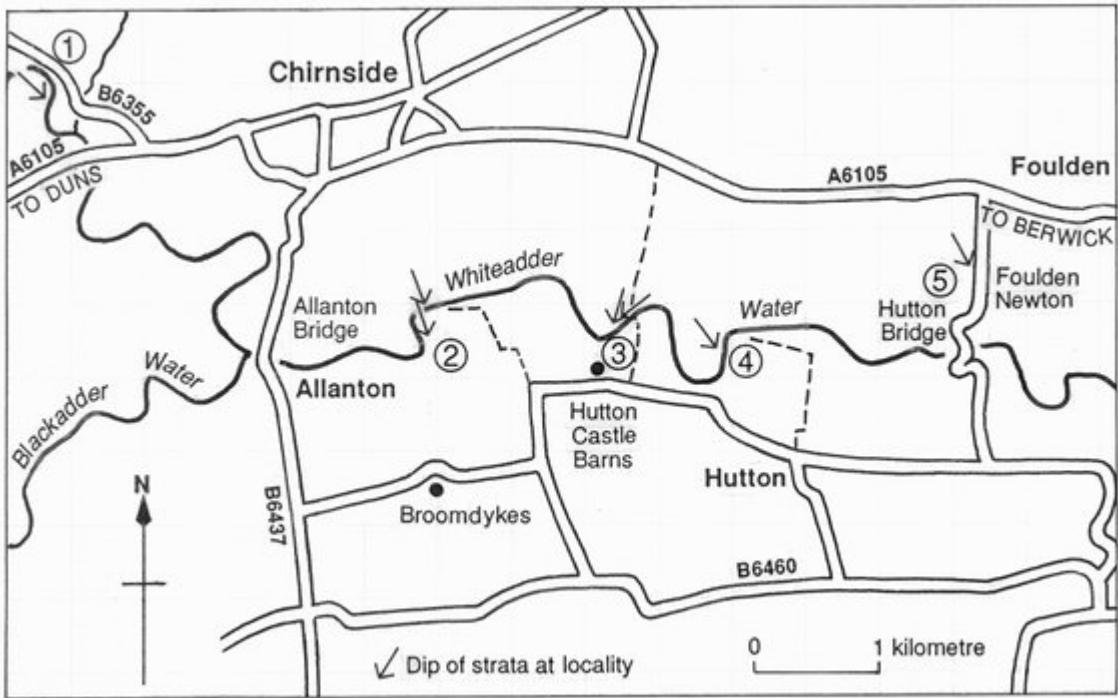
(Figure 16) Spittal foreshore, south part.



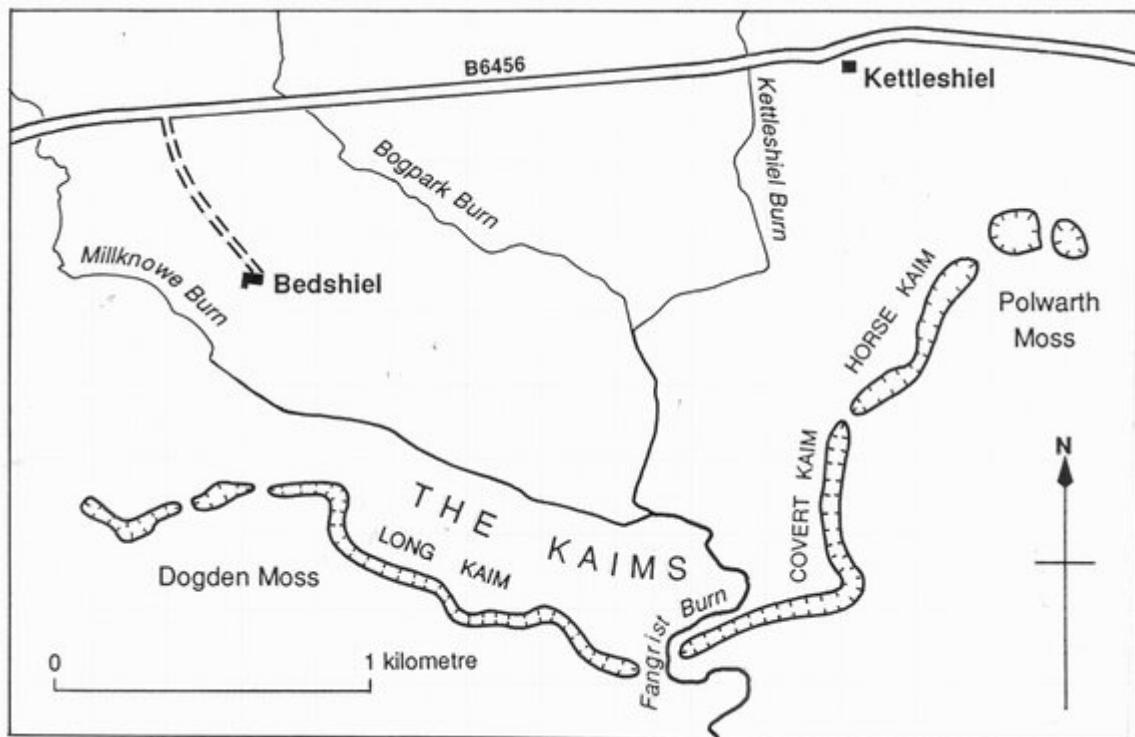
(Figure 17) Folds in the Eelwell Limestone.



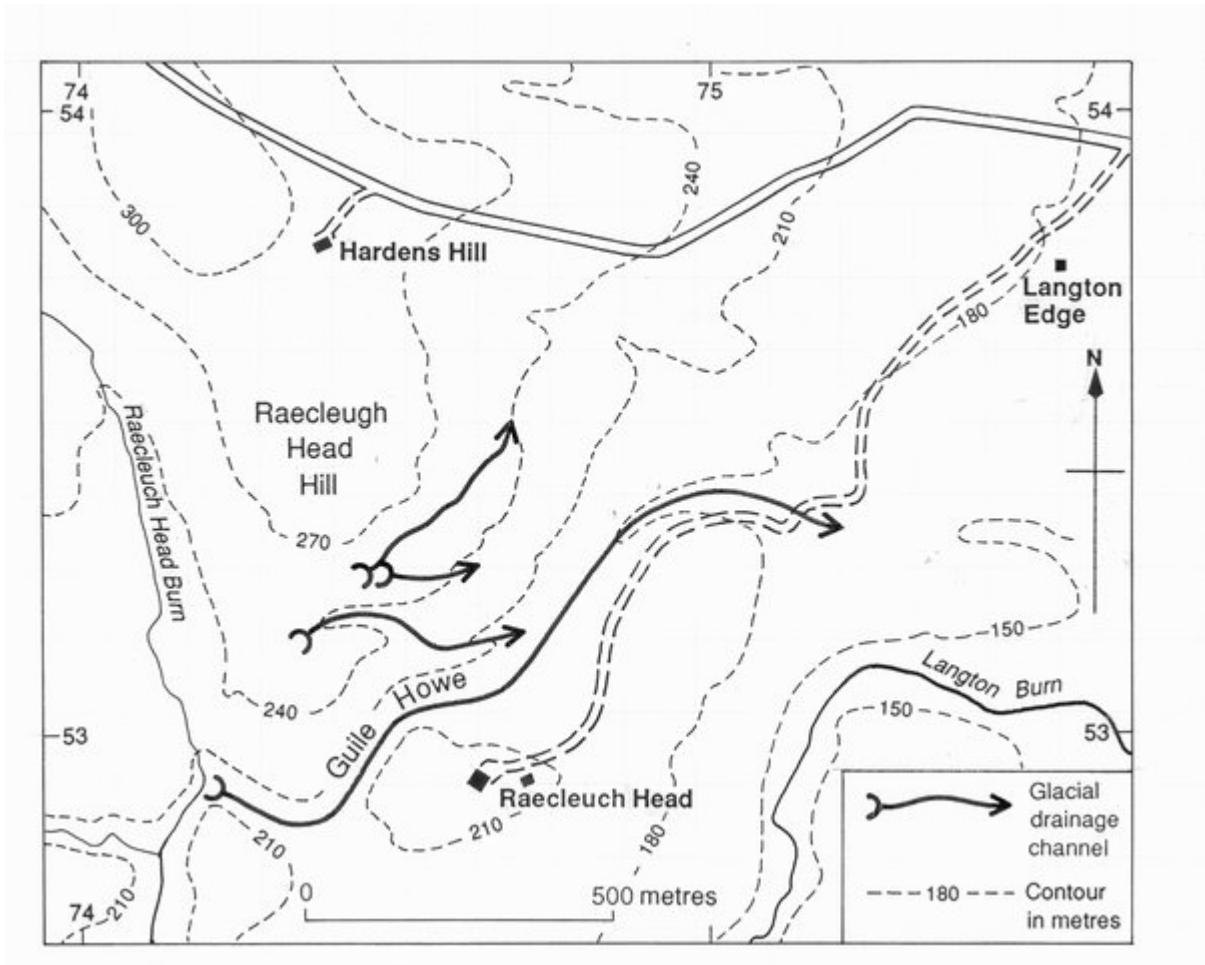
(Figure 18) Berwick Foreshore.



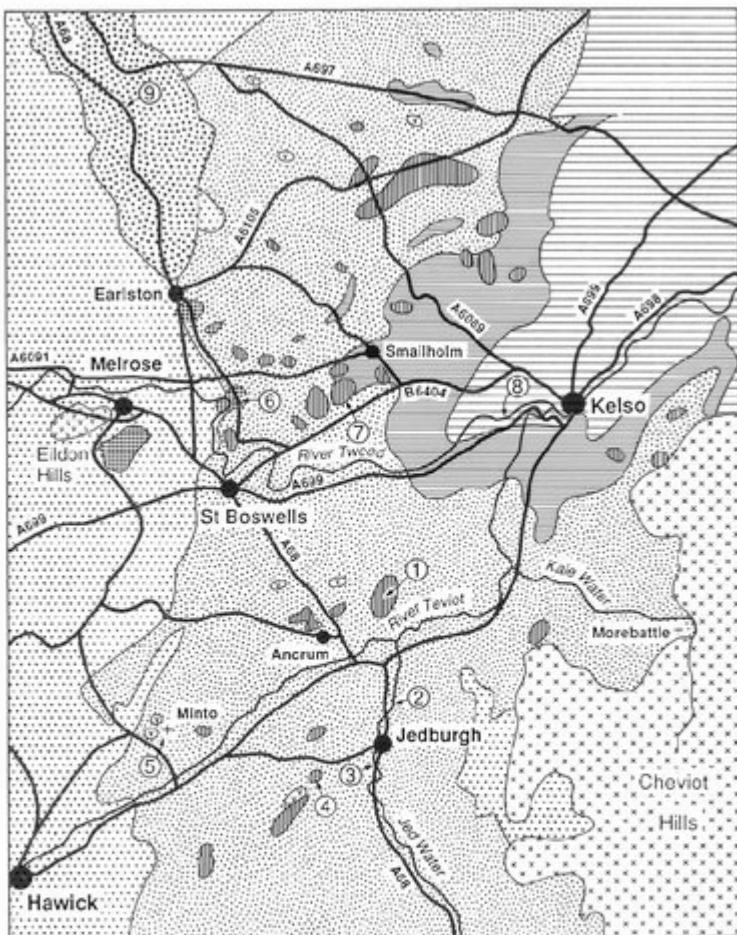
(Figure 19) Whiteadder Water excursion.



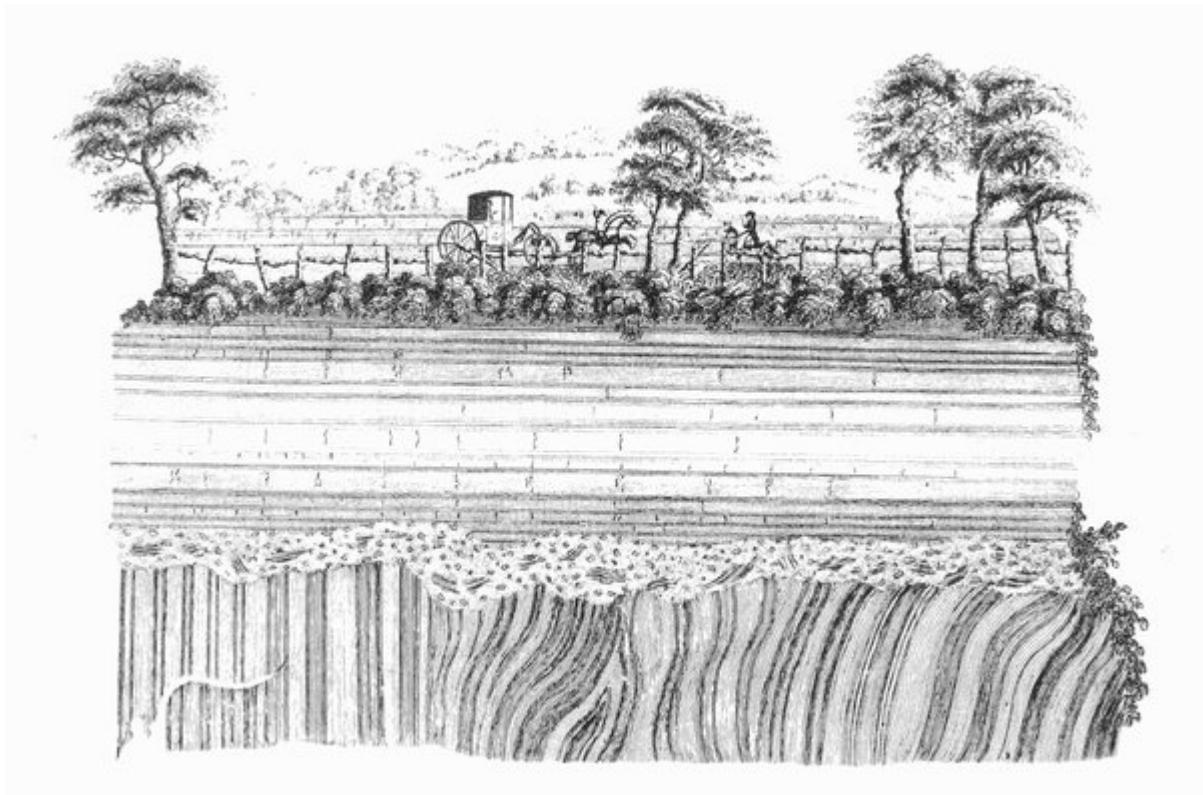
(Figure 20) Bedshiel.



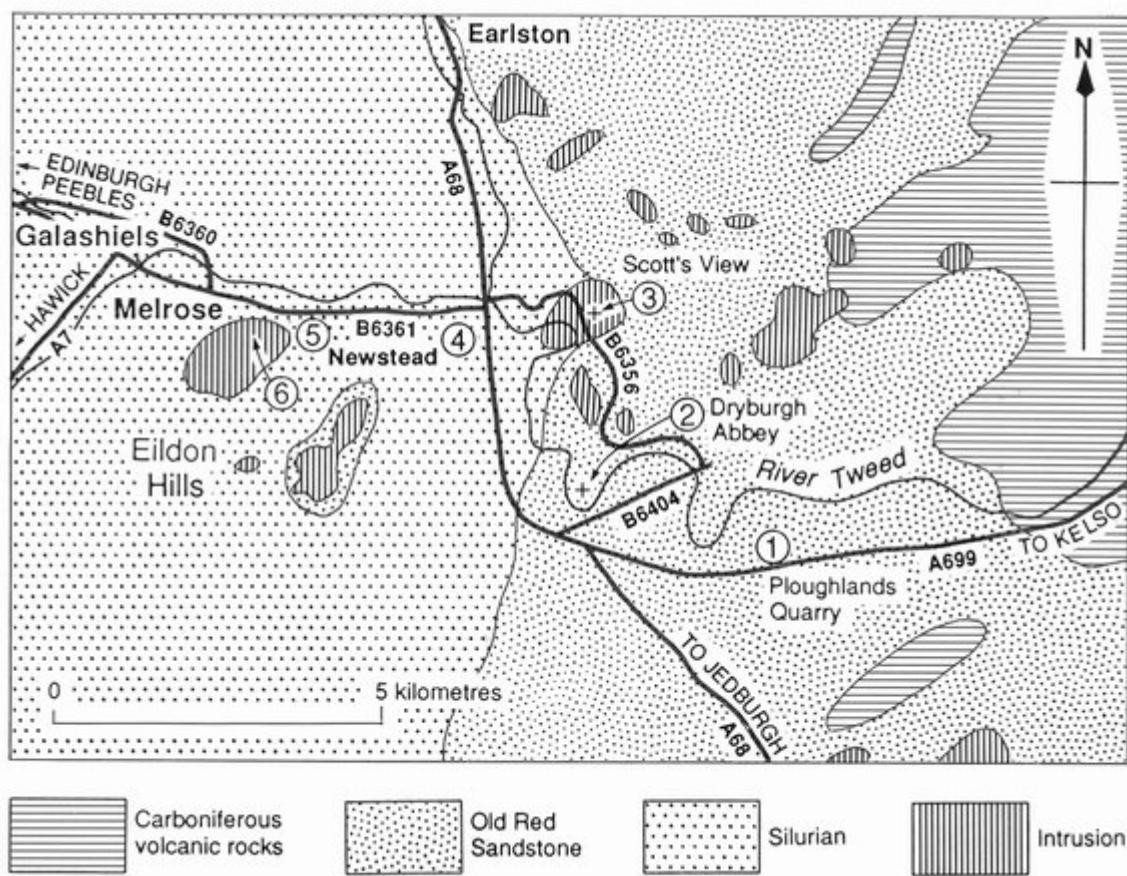
(Figure 21) Raecleuch Head



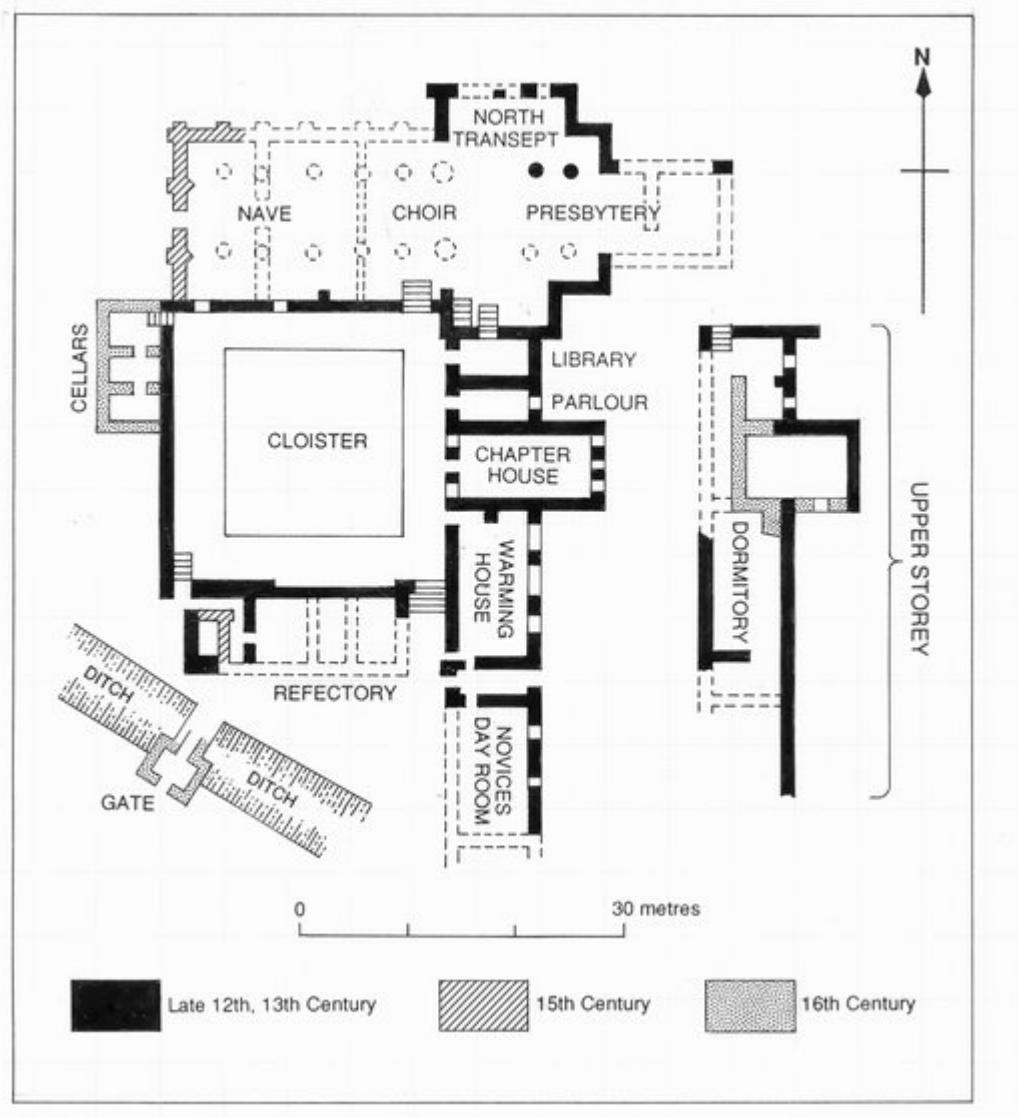
(Figure 22) Jedburgh–Melrose–Kelso.



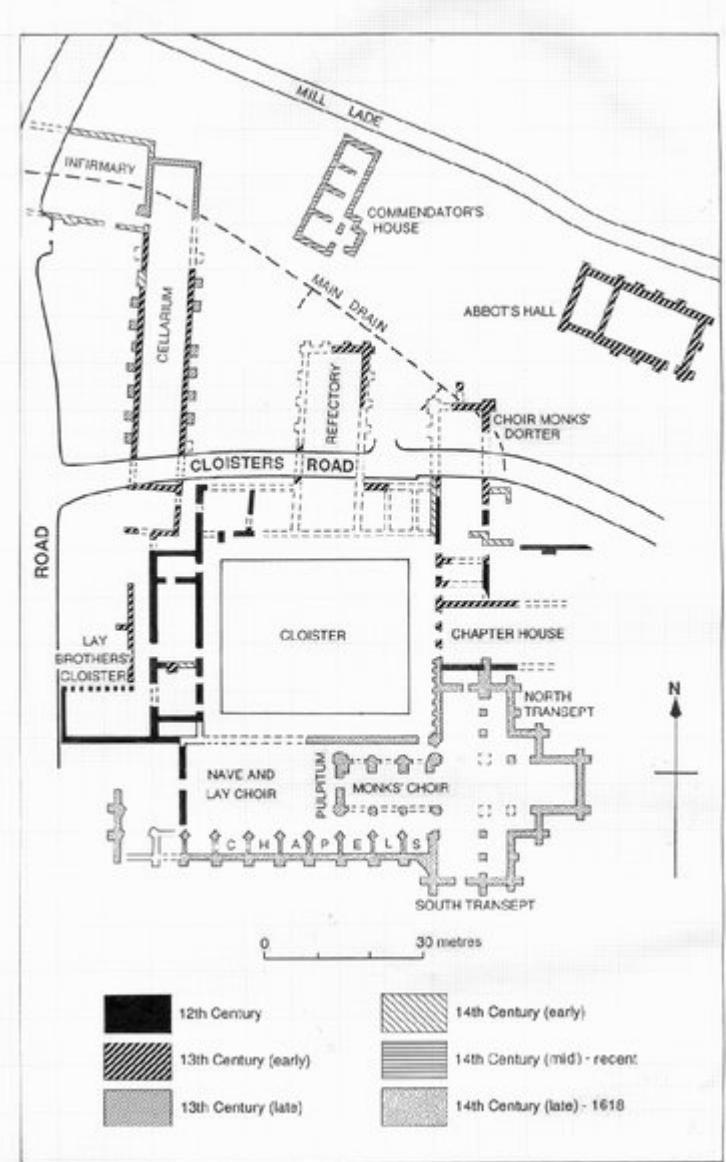
(Figure 23) Hutton's unconformity at Jedburgh.



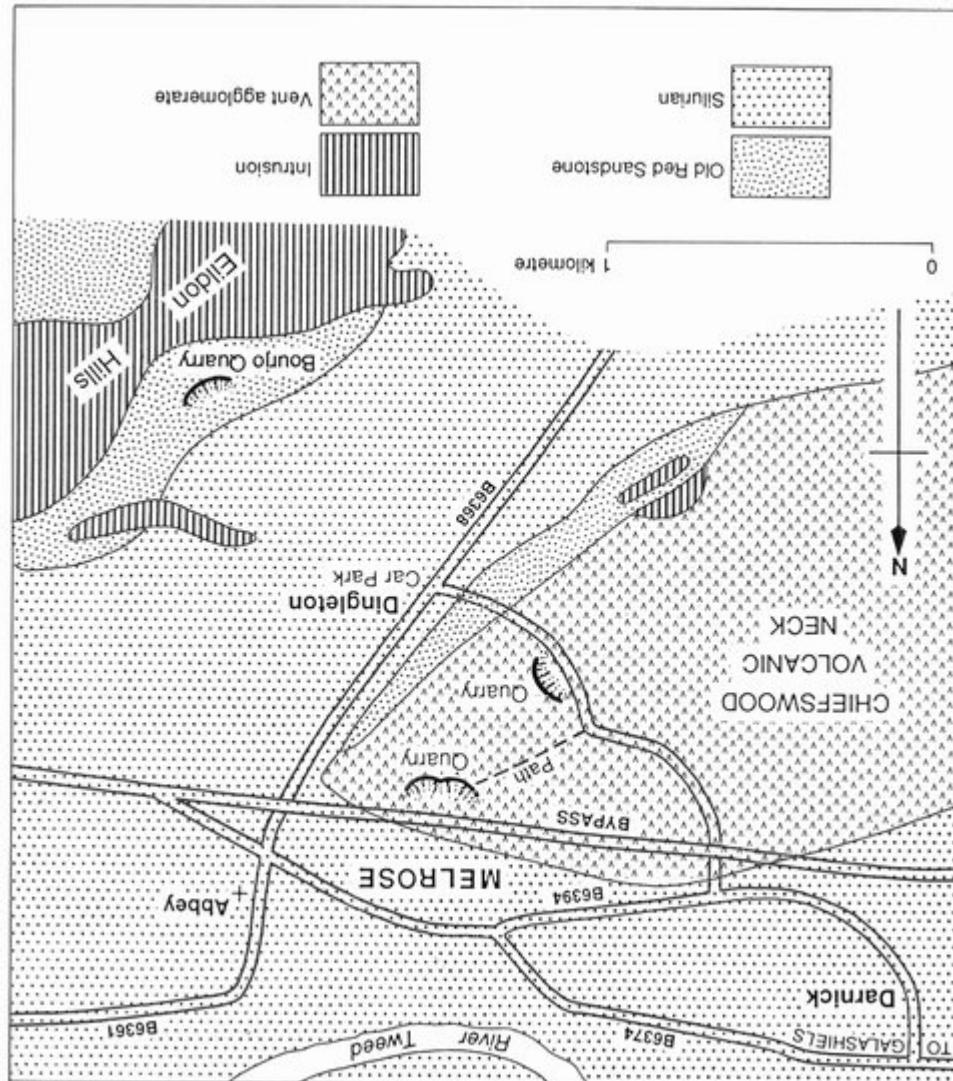
(Figure 24) Border Abbeys excursion.



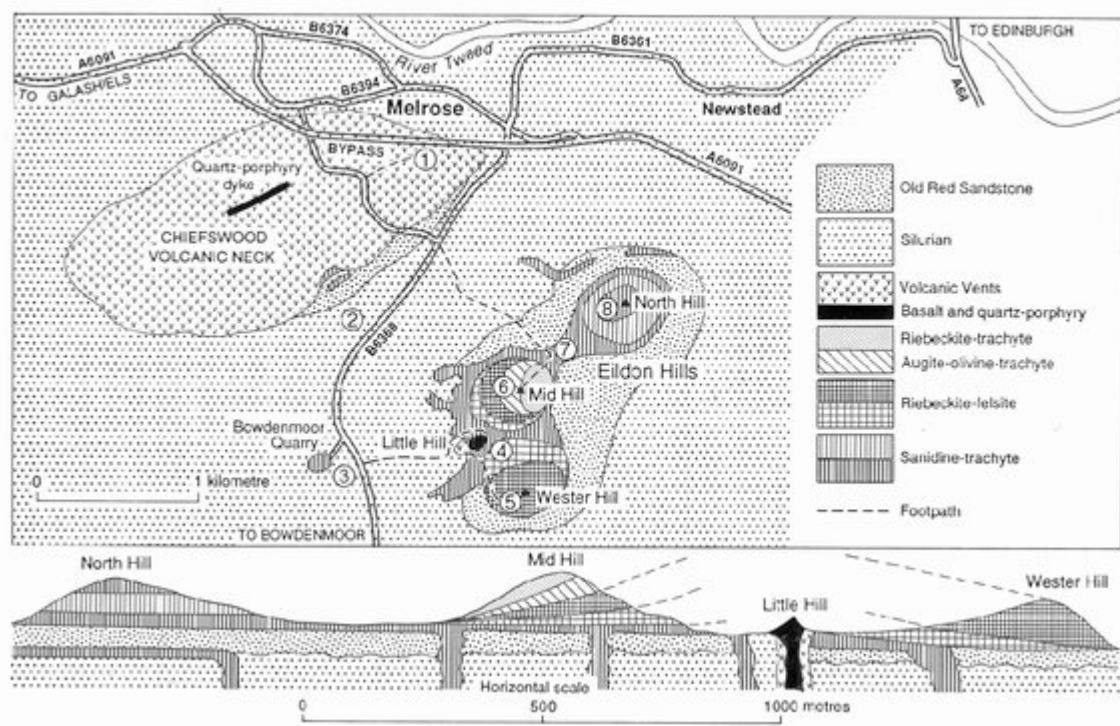
(Figure 25) Dryburgh Abbey.



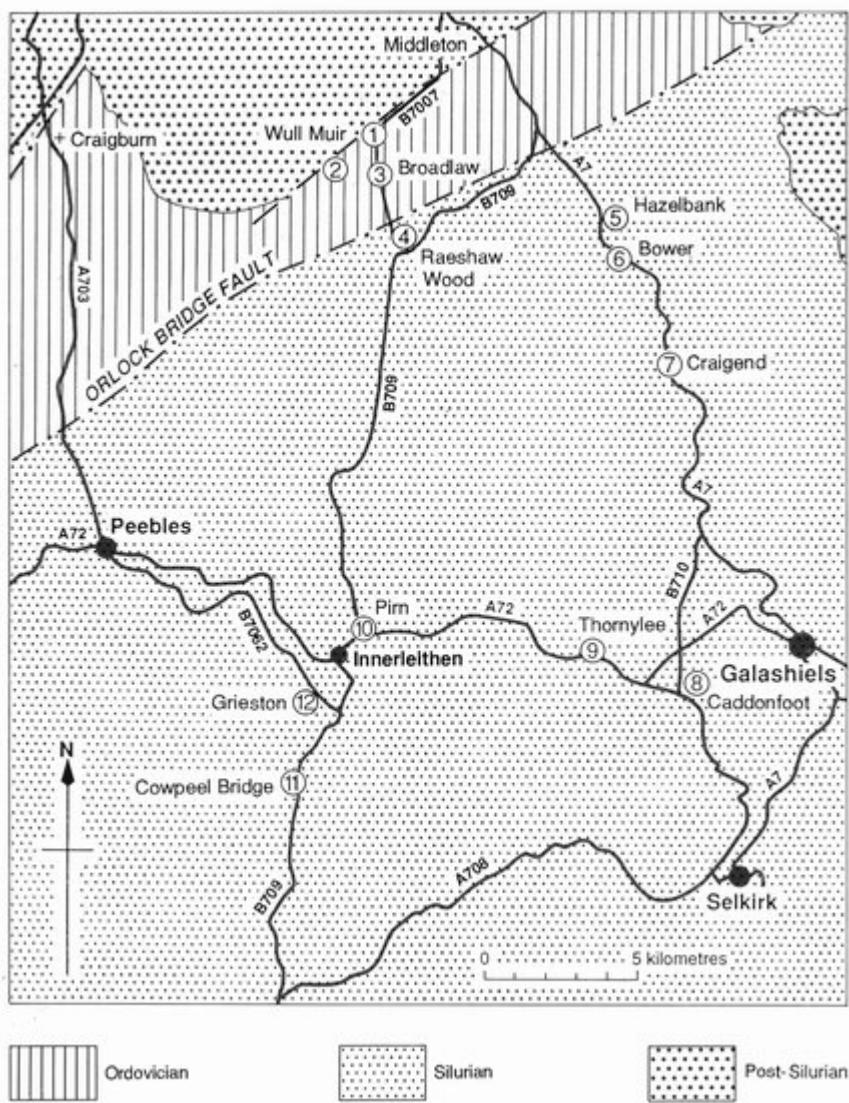
(Figure 26) Melrose Abbey.



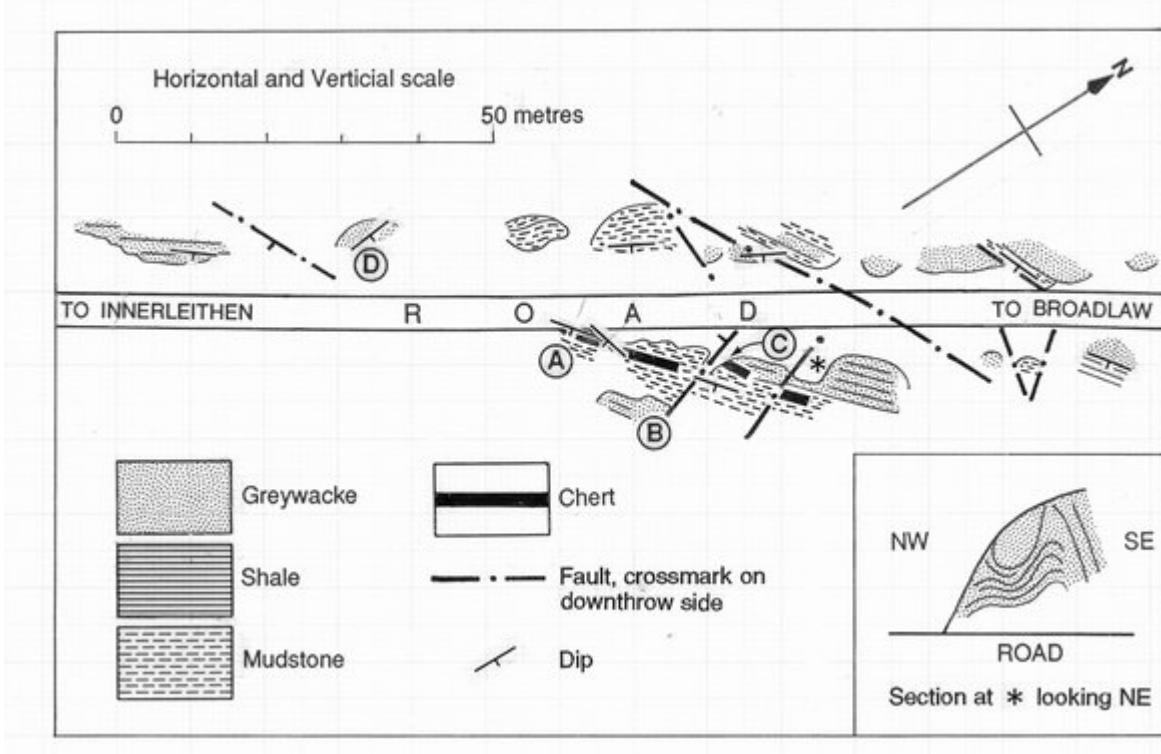
(Figure 27) Chiefswood.



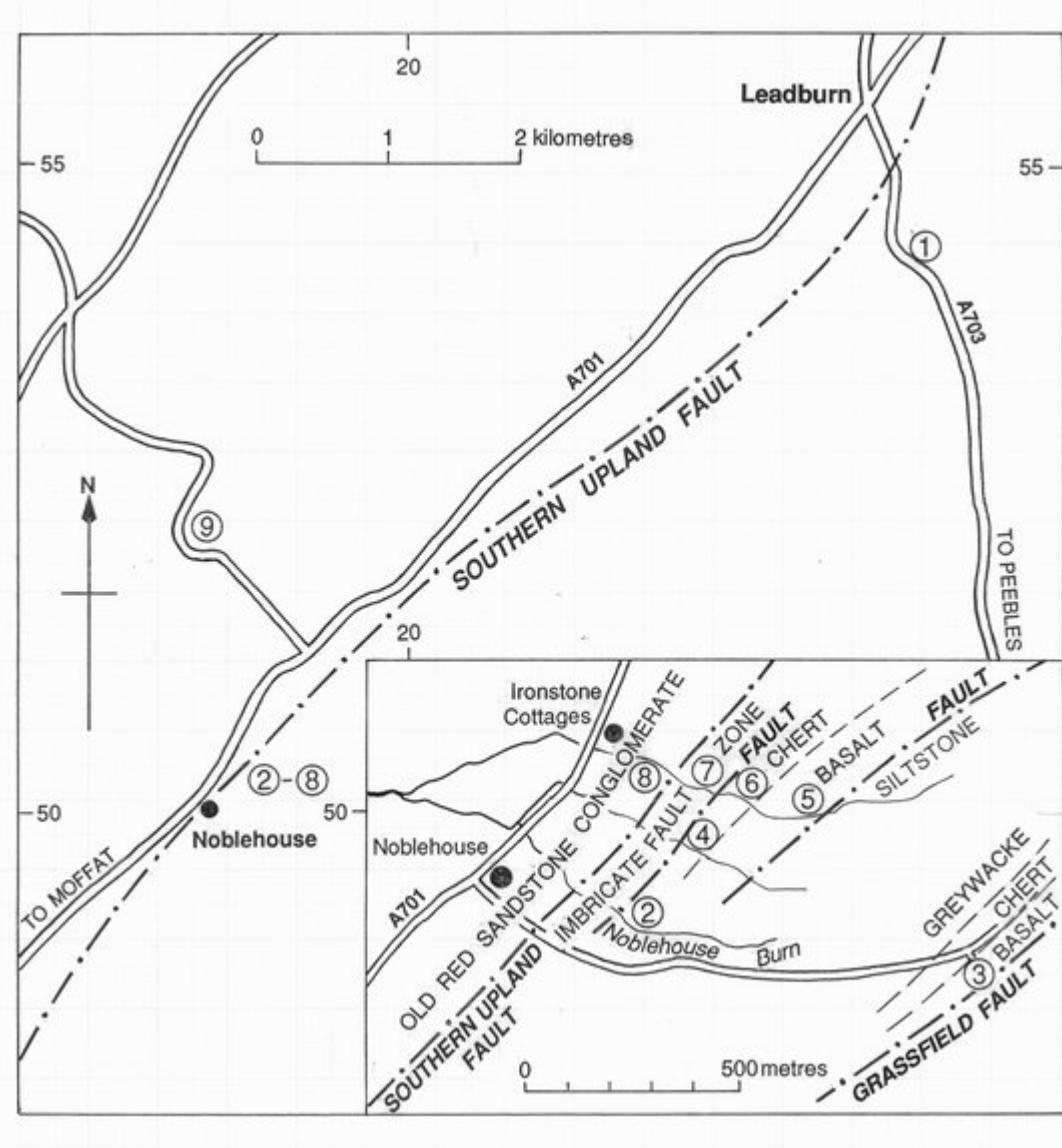
(Figure 28) Eildon Hills excursion.



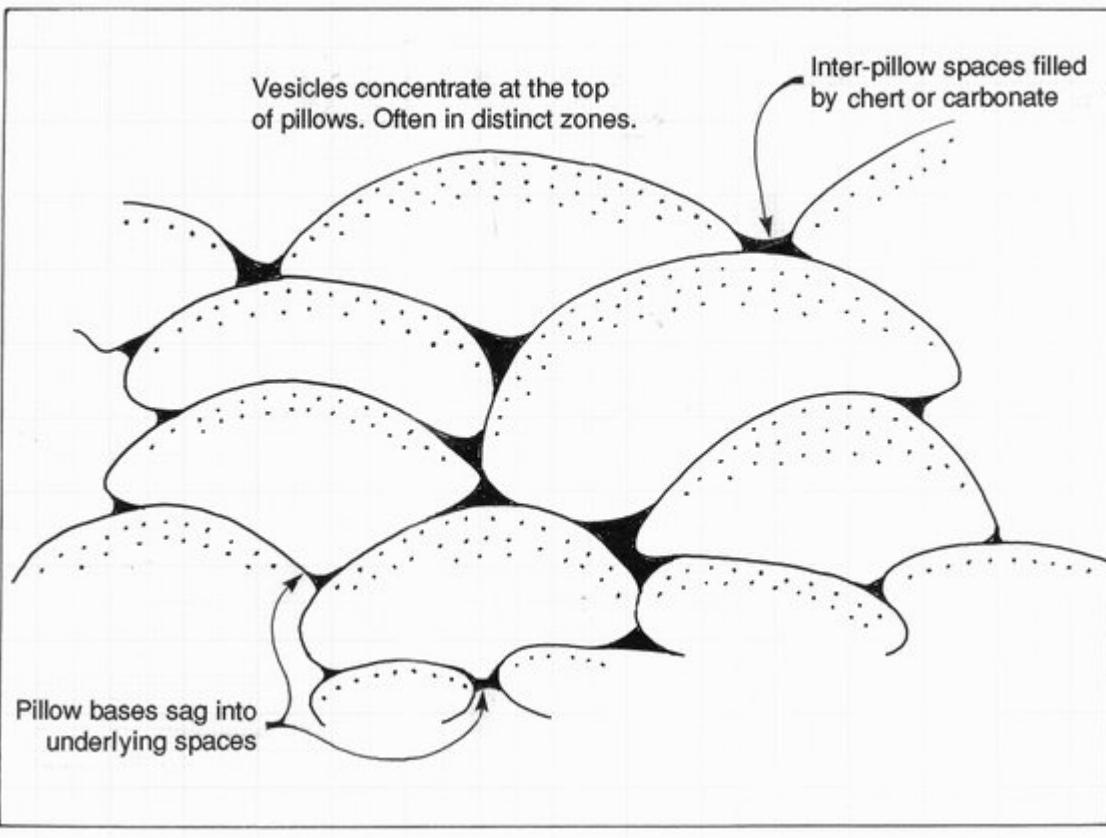
(Figure 29) Heriot and Innerleithen excursion.



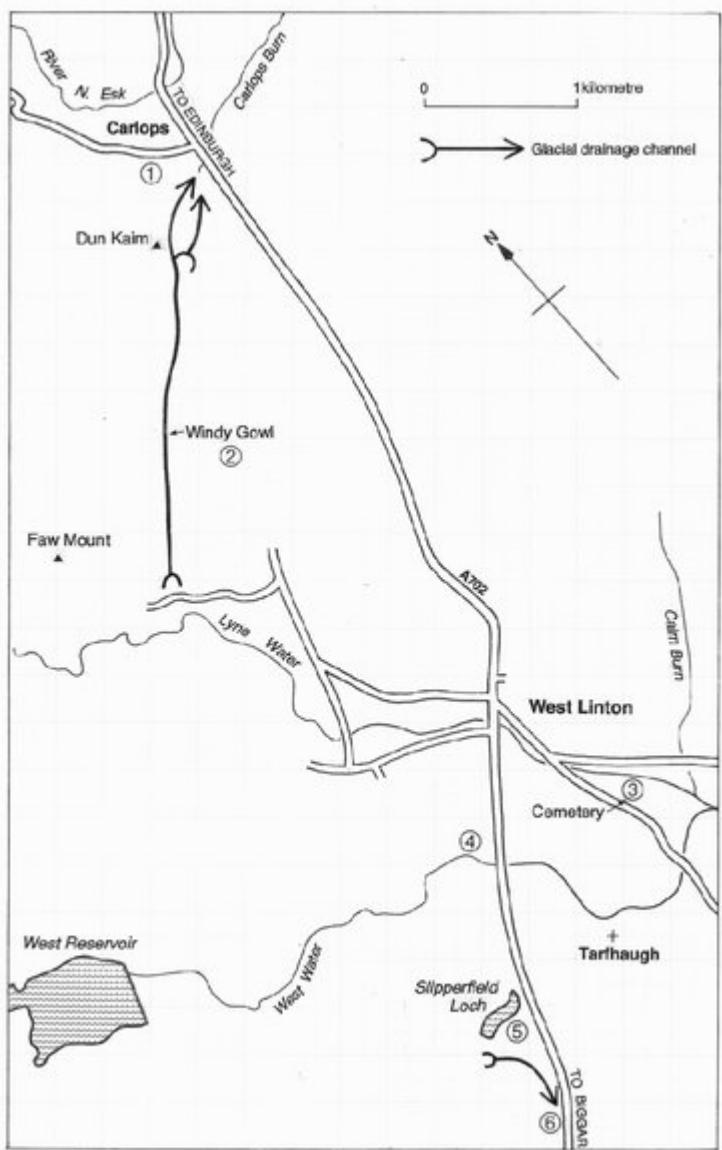
(Figure 30) Broadlaw.



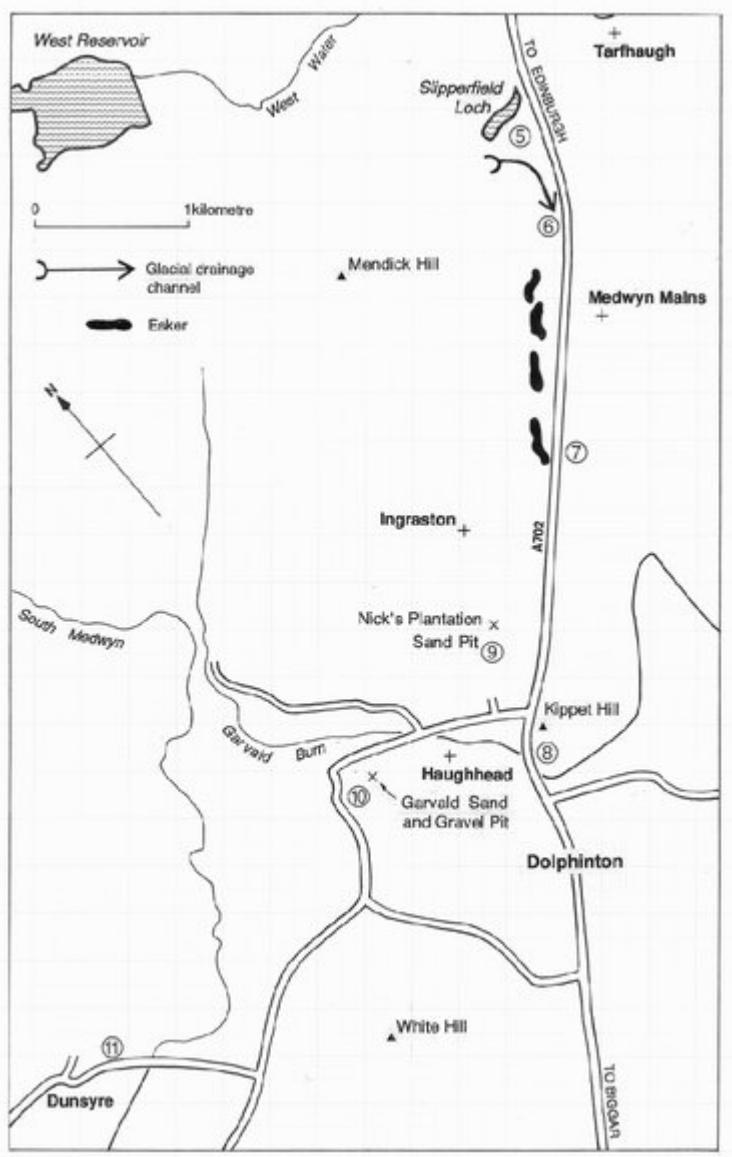
(Figure 31) Noblehouse, Lamancha excursion.



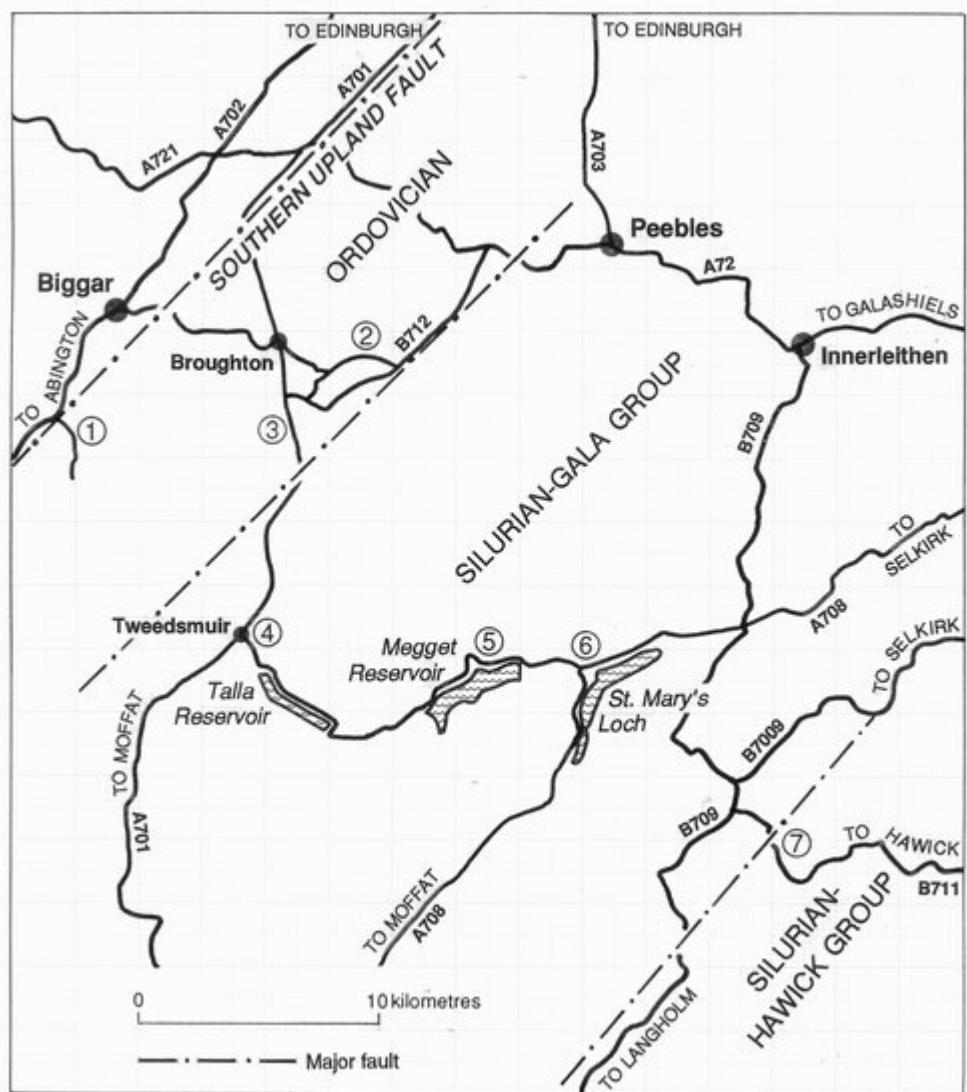
(Figure 32) Pillow lavas.



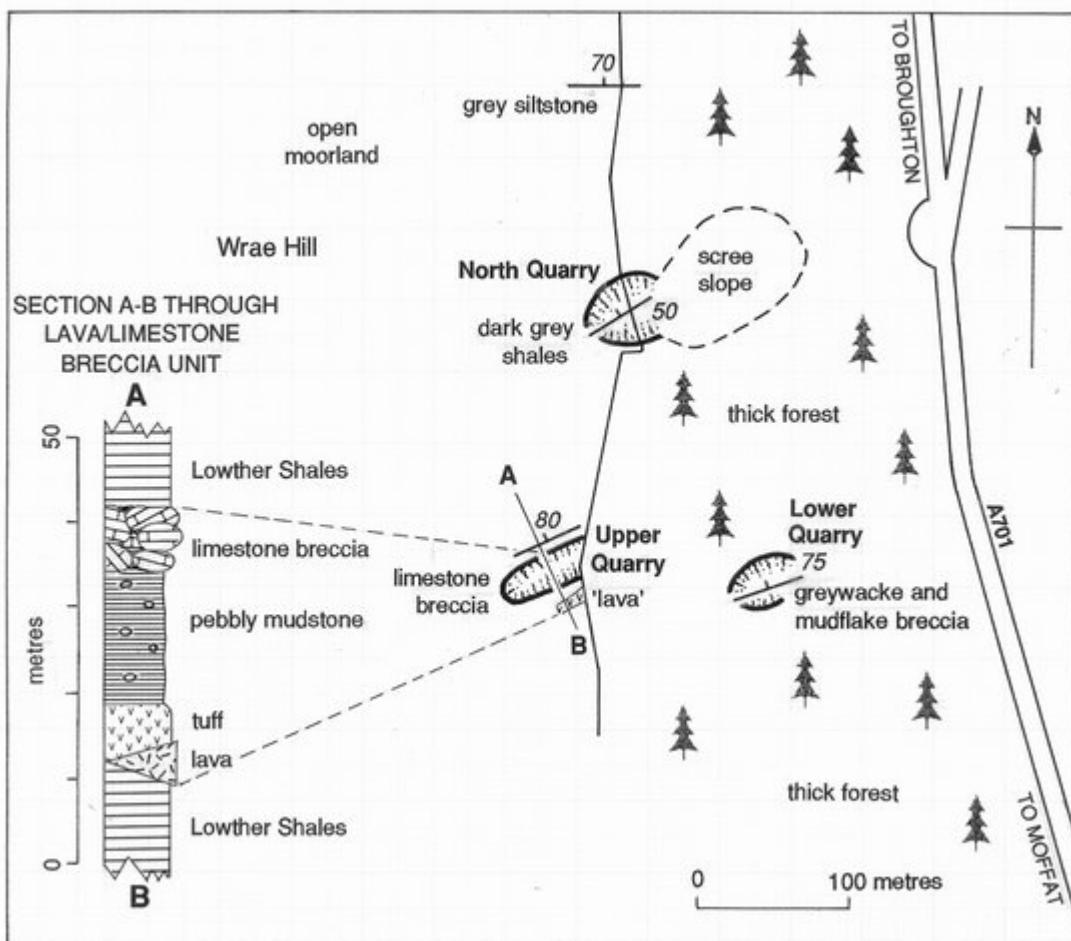
(Figure 33) Carlops.



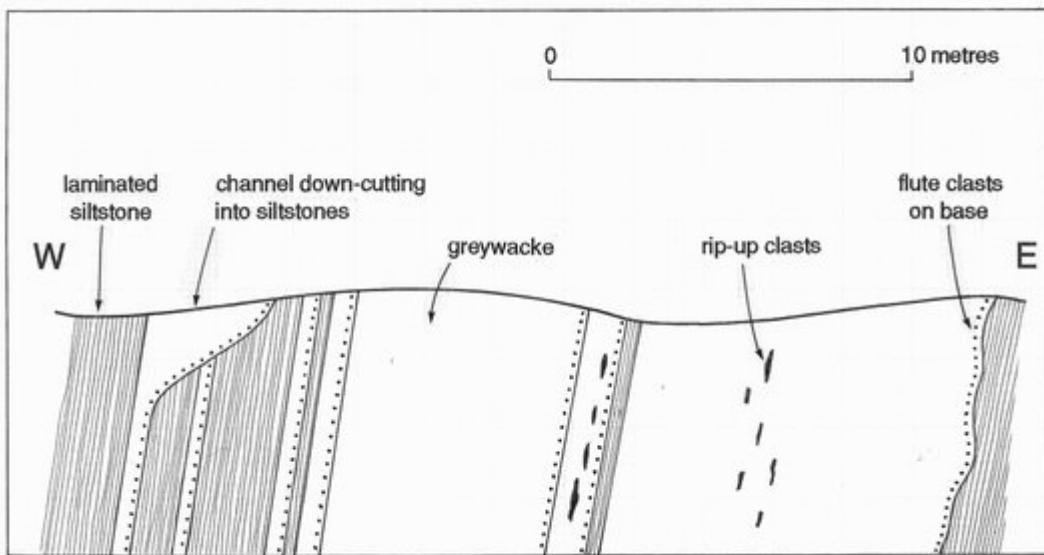
(Figure 34) Dolphinton.



(Figure 35) Tweedsmuir excursion.

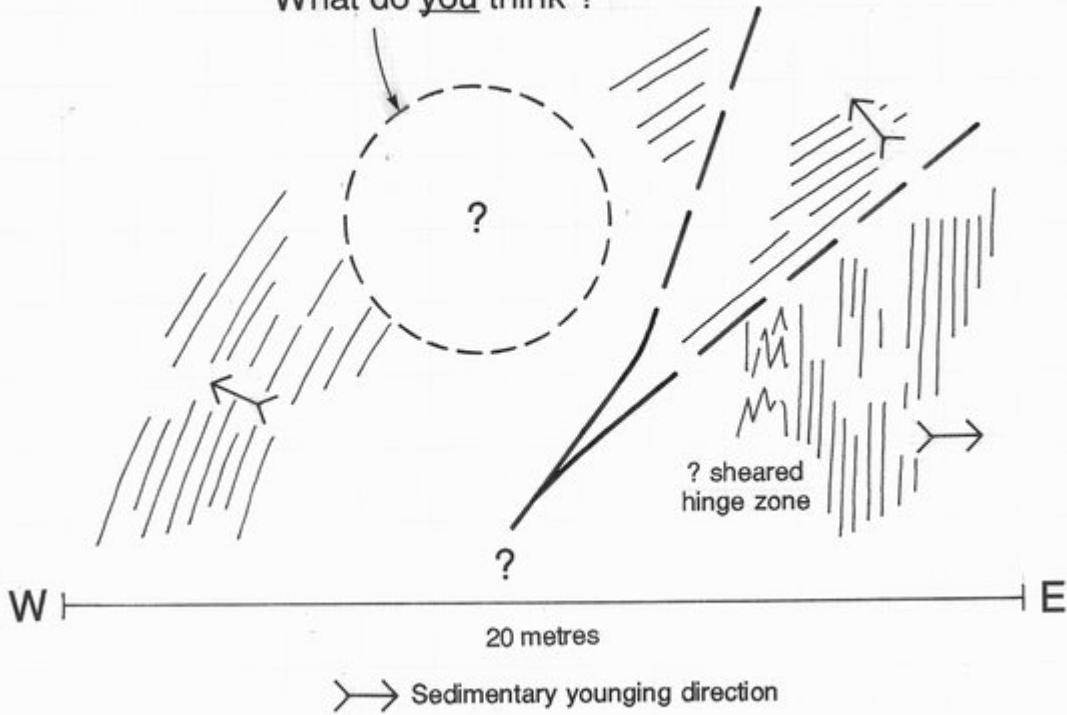


(Figure 36) Wrae Limestone Quarries.

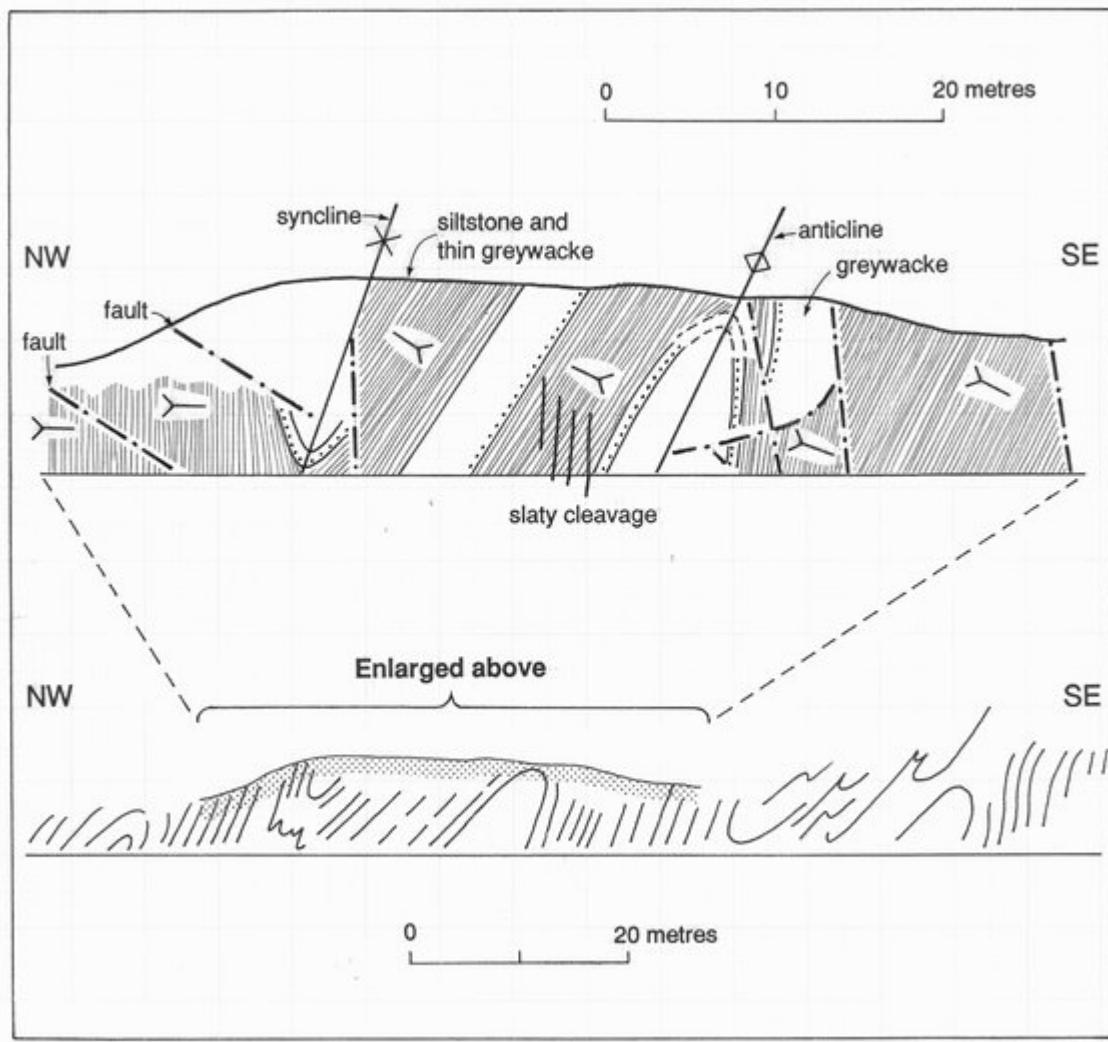


(Figure 37) Cramalt road section, Megget.

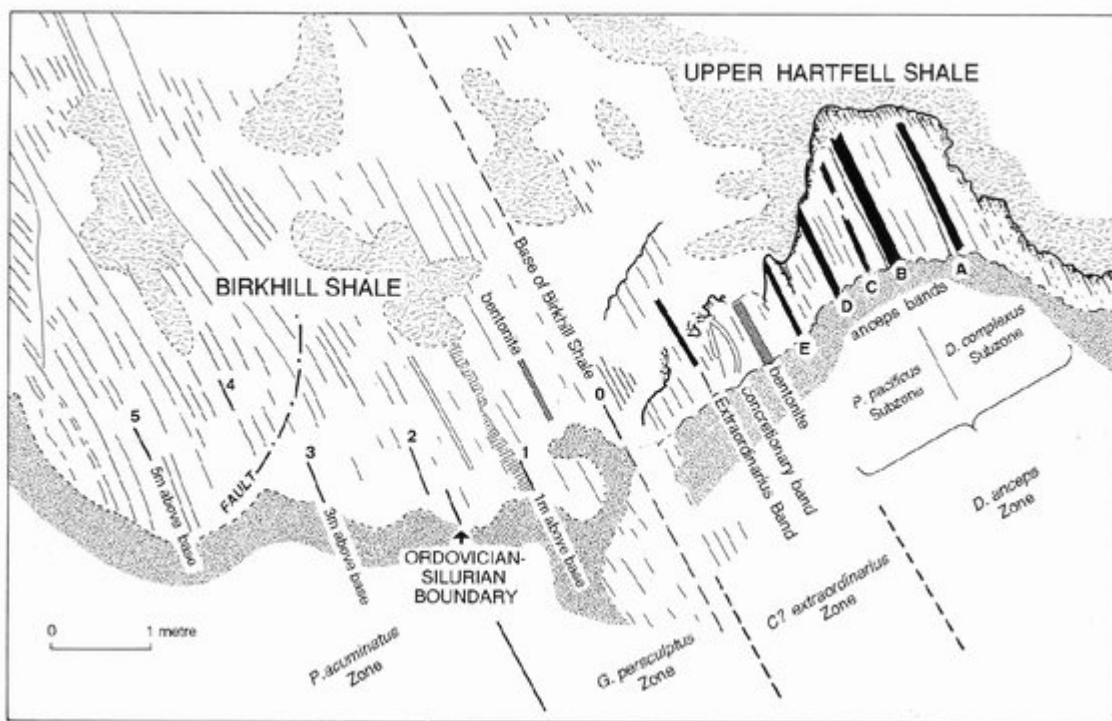
Younging evidence in this area is ambiguous.
Is there additional structural complication ?
What do you think ?



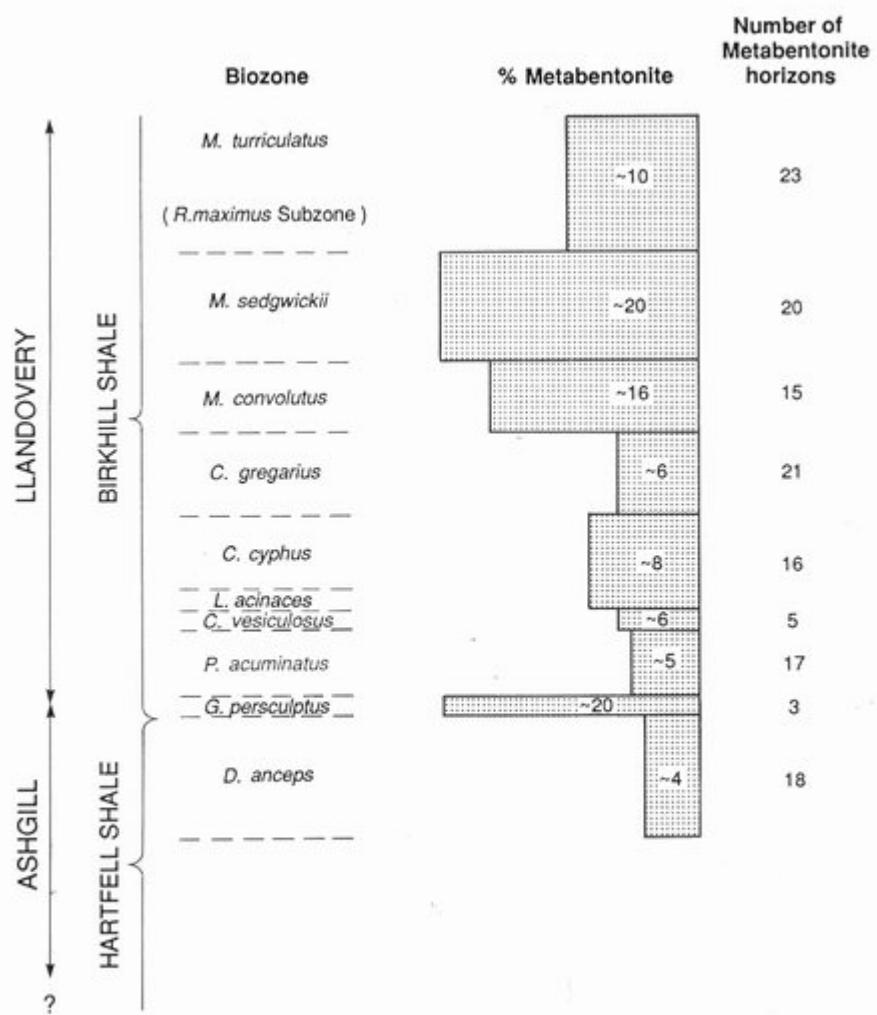
(Figure 38) Structural problem, Cappercleuch Quarry.



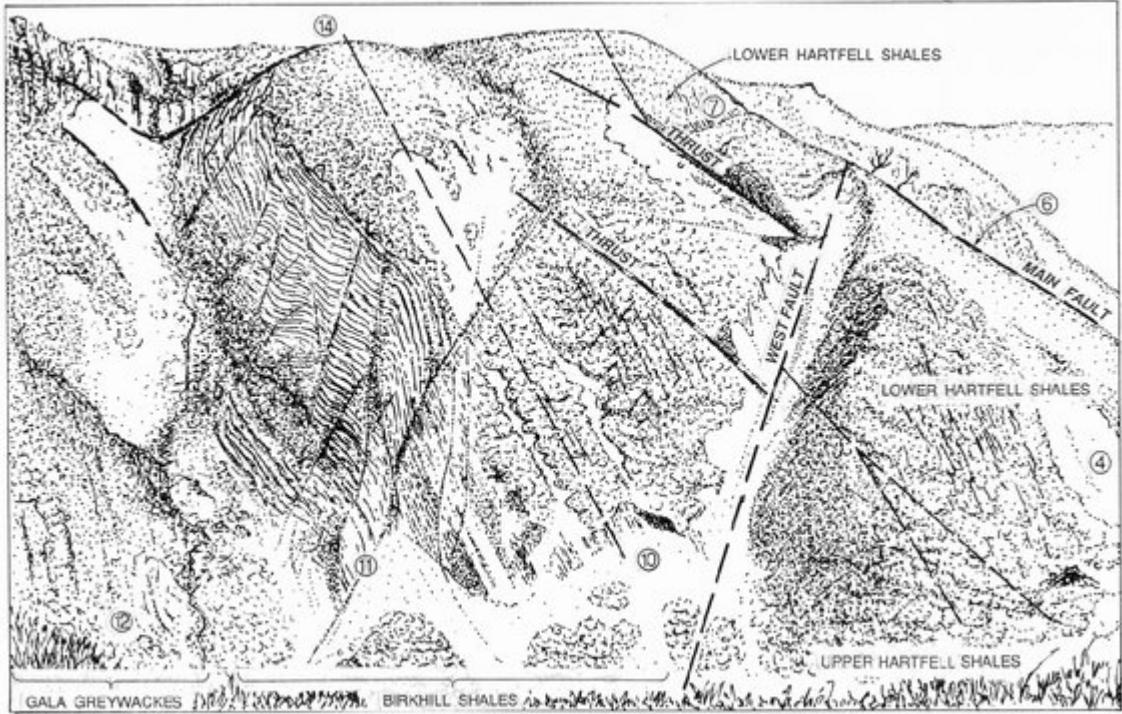
(Figure 39) Hawick road section, Tushielaw.



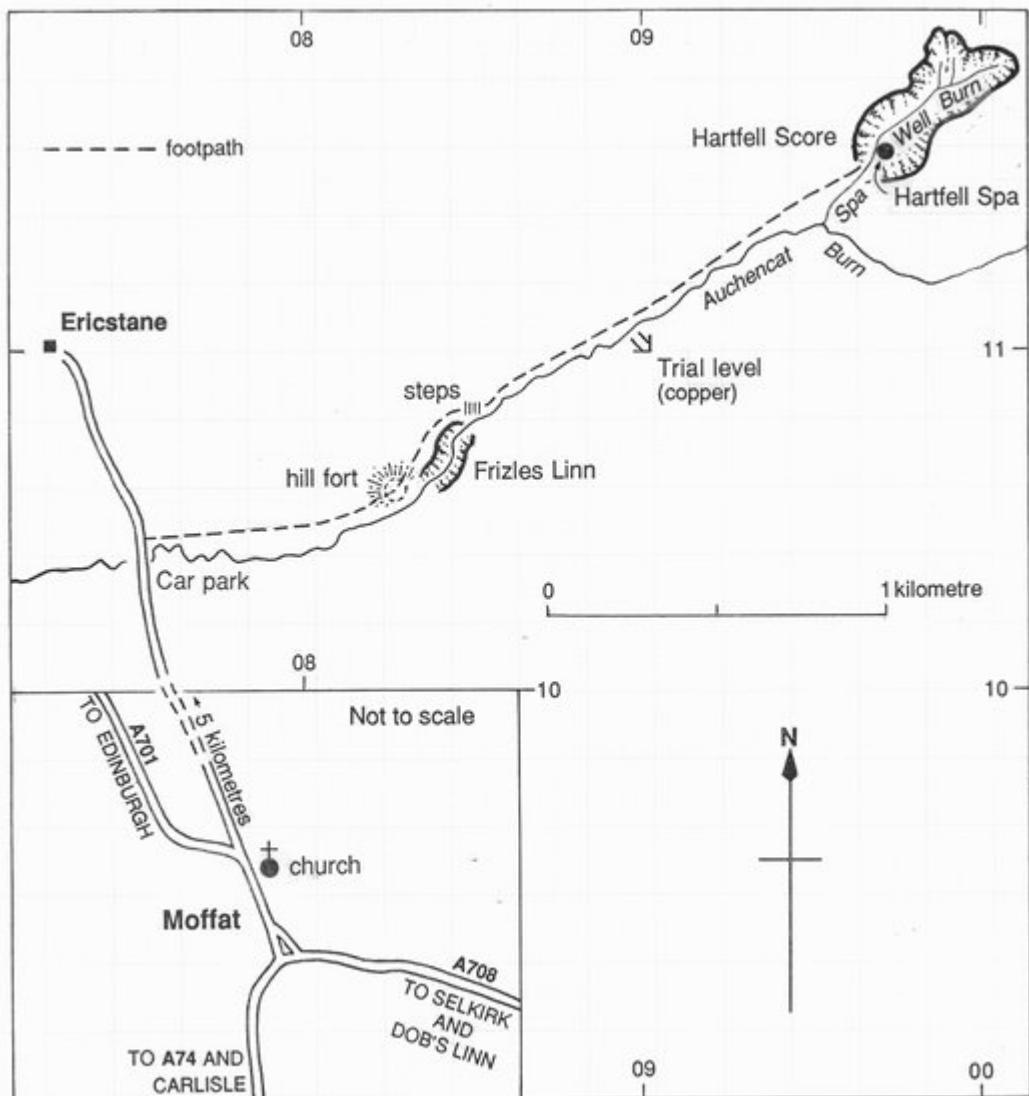
(Figure 40) The anceps bands and Ordovician/Silurian boundary stratotype in Linn Branch transect (modified after Williams 1983).



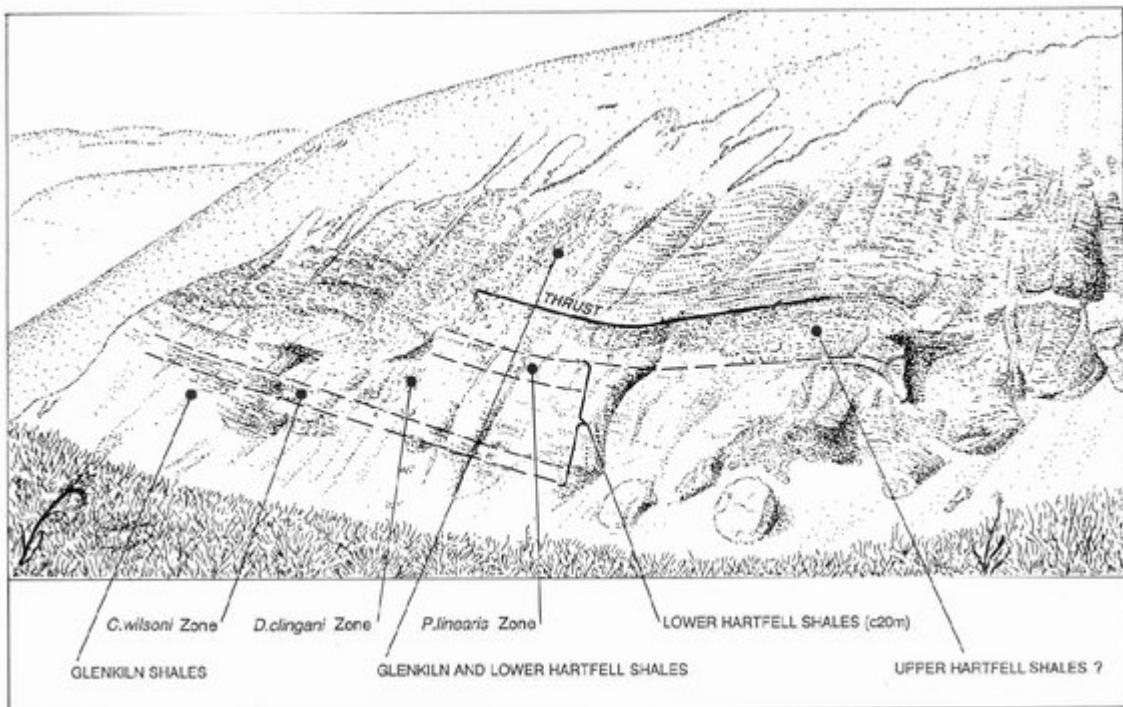
(Figure 41) Biostratigraphical distribution of metabentonite horizons at Dob's Linn and amounts and proportion of metabentonite in graptolitic zones.



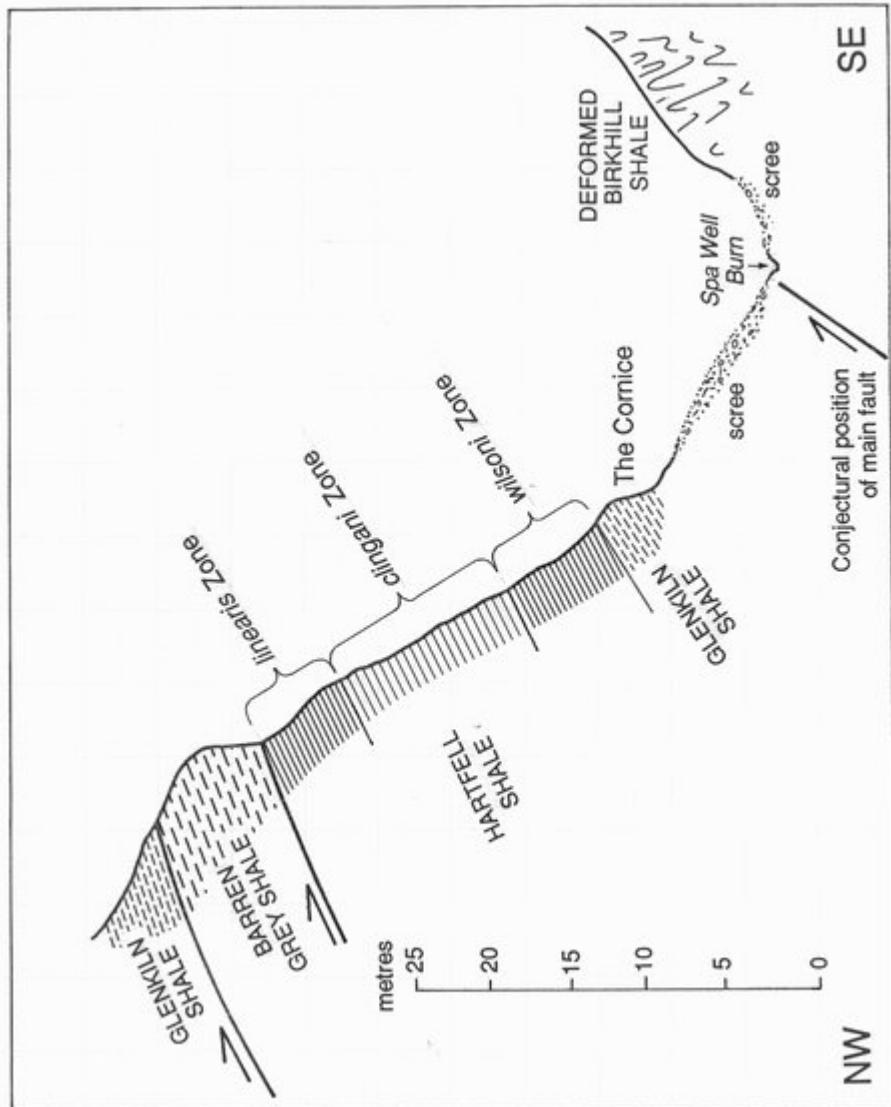
(Figure 42) Panoramic view of North Cliff from locality 15.



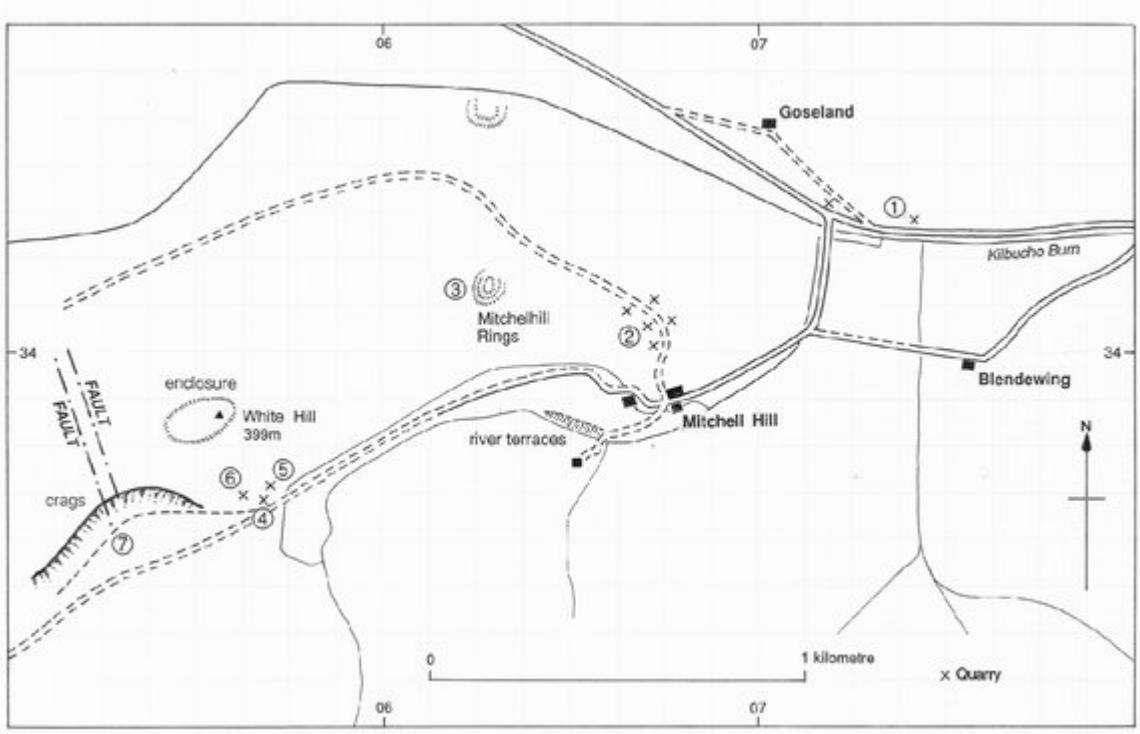
(Figure 43) Hartfell Score excursion.



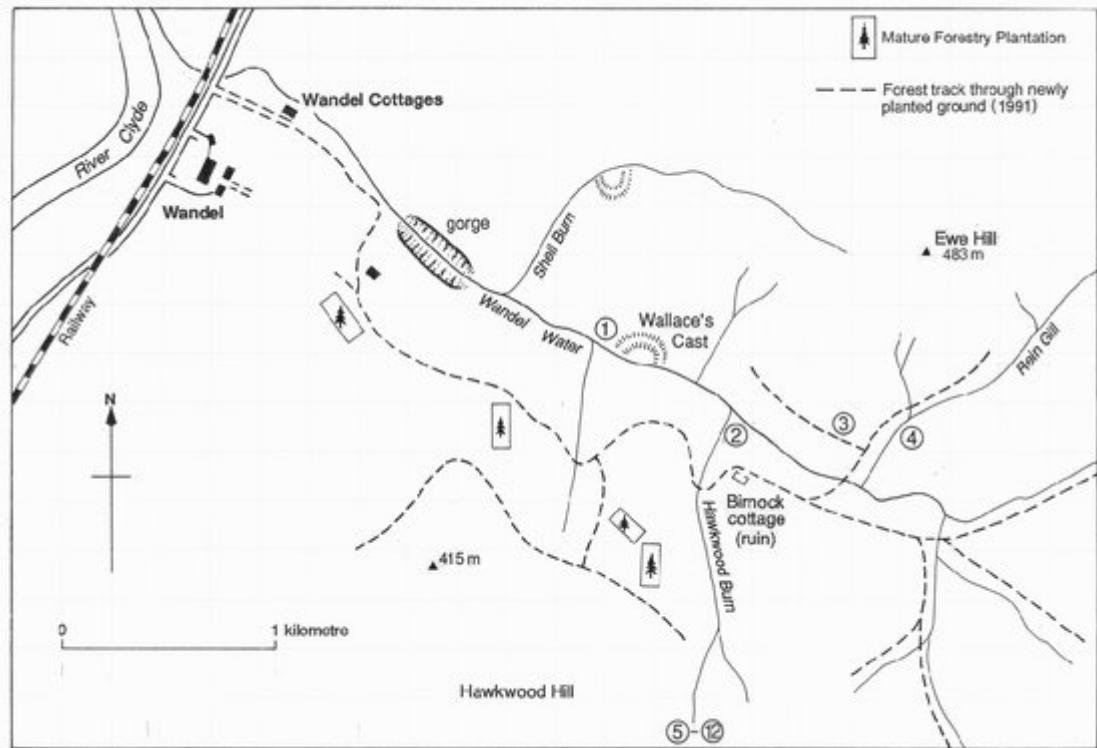
(Figure 44) View of Hartfell Score.



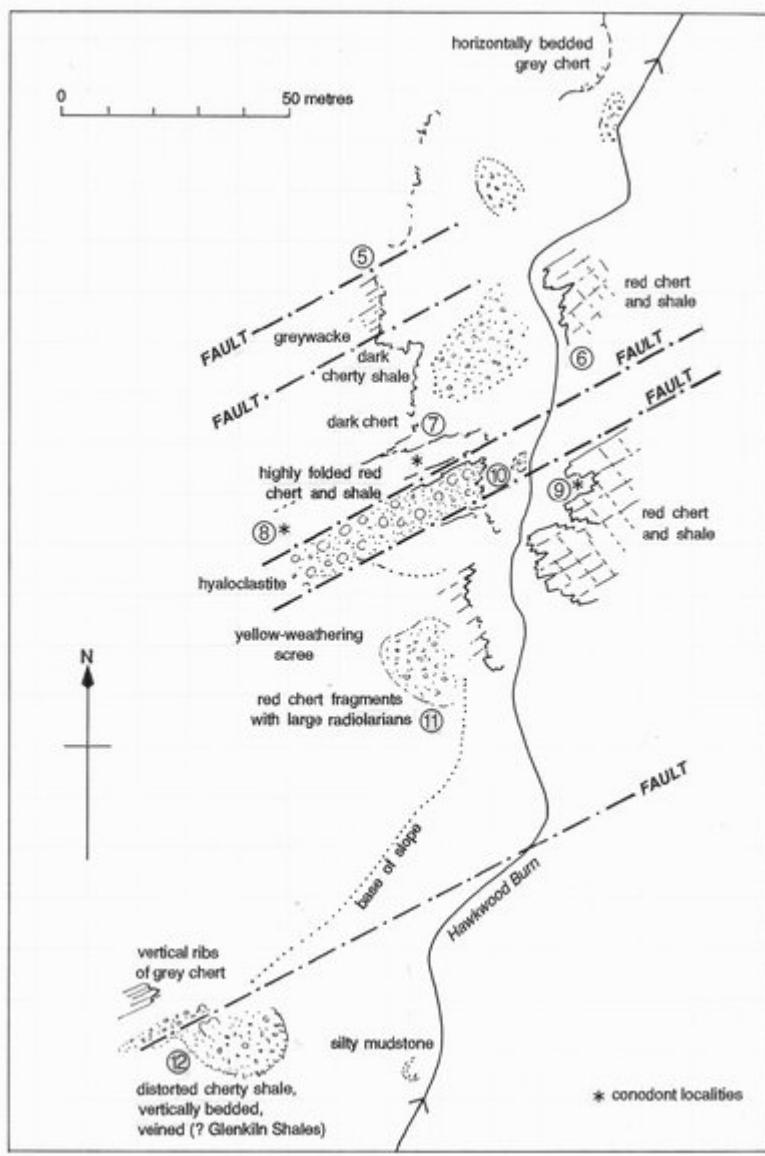
(Figure 45) Main cliff, Hartfell Score.



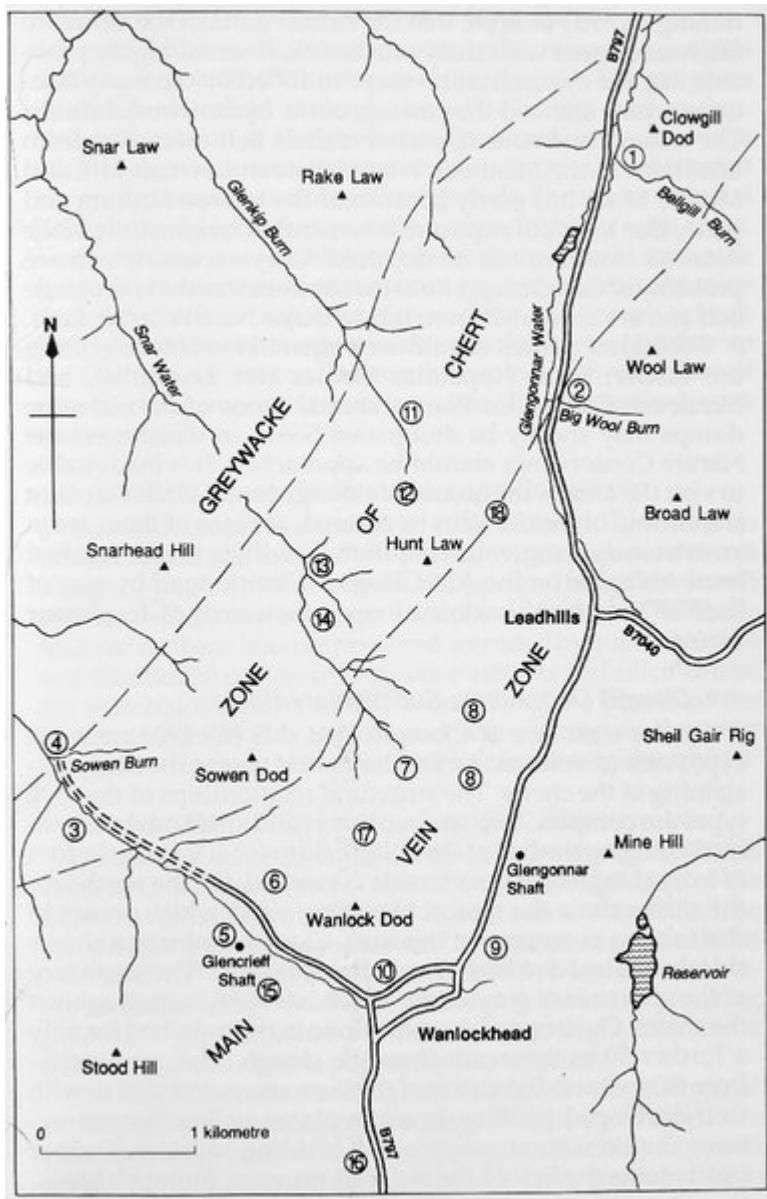
(Figure 46) Kilbucho.



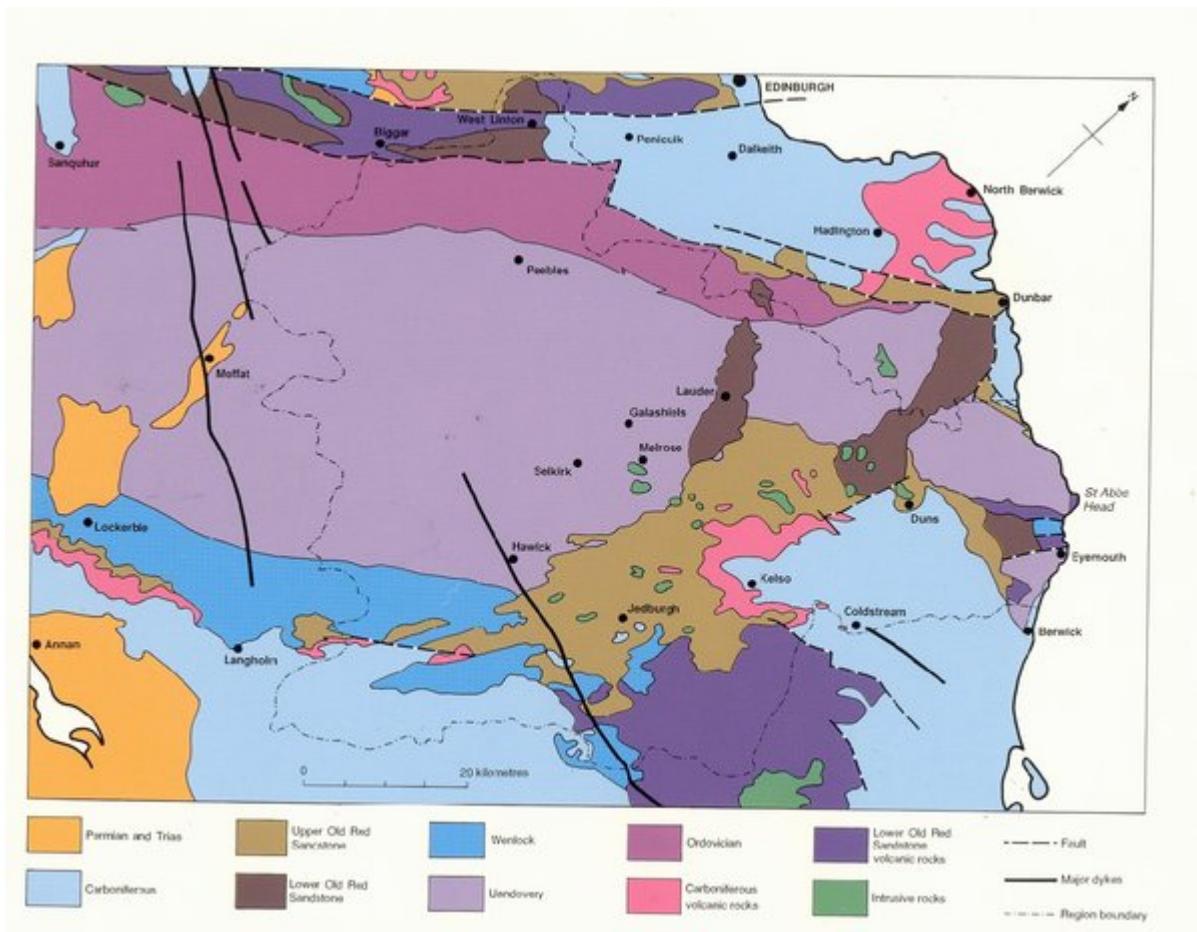
(Figure 47) Wandel Water.



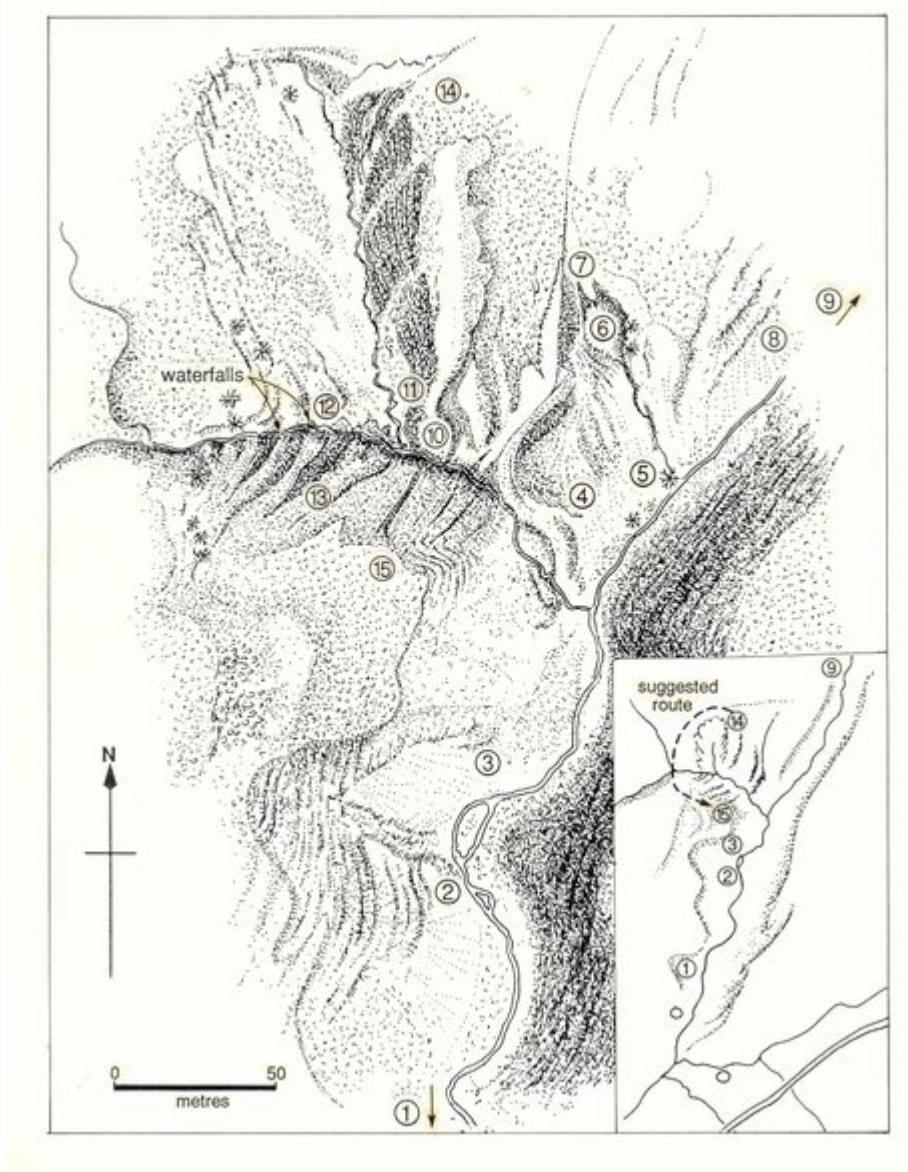
(Figure 48) Upper Hawkwood Burn.



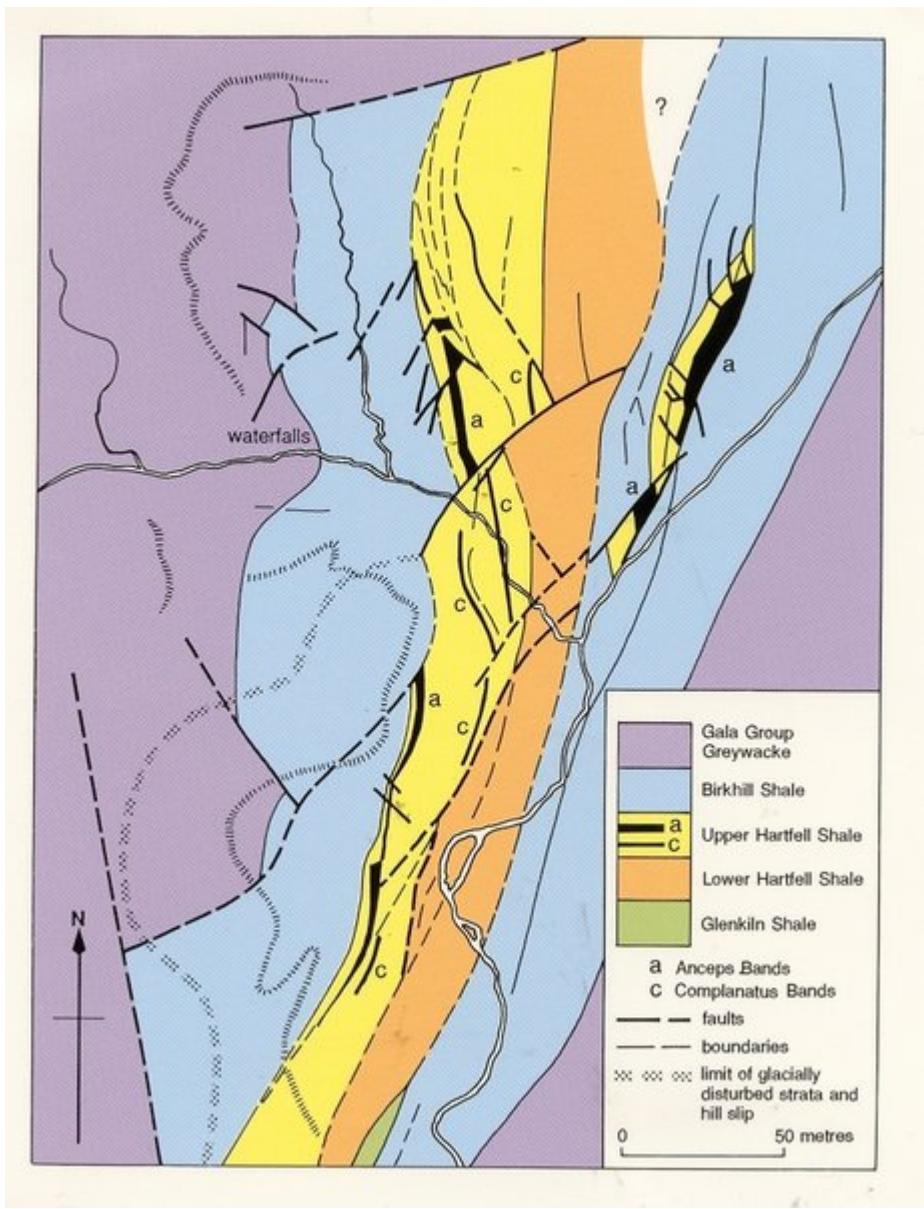
(Figure 49) Leadhills and Wanlockhead excursion.



(Plate 1) Geological map of the Scottish Borders area.



(Plate 2) Overhead view of Dob's Linn.



(Plate 3) Map of Dob's Linn area. Geological column, timescale after Harland (1989).