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# Cadnant Cutting

[SH 776 778]–[SH 779 776]

## Introduction

This section is important both historically and for regional correlation. It provides a thick and undeformed section through the graptolitic Cadnant Shale Formation, the northernmost equivalent of the Nod Glas Formation that extends over a large area of North Wales. Although the site is effectively the type (or at least the original) section for the *D. multidentis* Zone, there are now severe doubts as to whether that zone is actually present in the section.

The railway cutting in the Cadnant area of Conwy exposes a complete sequence from the upper part of the Snowdon Volcanic Group, namely the undifferentiated middle to upper Crafnant Volcanic Formation of Caradoc age, through the richly graptolitic Cadnant Shale Formation, to the lower part of the Ashgill Bodeidda Mudstone. The site provides a fairly undisturbed section through a shale unit that is a direct correlative of at least part of the Nod Glas Formation, which crops out extensively farther south (Cave, 1965) and which is generally disturbed tectonically. It was for part of the Cadnant Shales that Elles (1909) first coined the term 'zone of *Diplograptus multidentis* and *Dicranograptus brevicaulis*', the forerunner of the *D. multidentis* Zone. However, Strachan (in Wood and Harper, 1962) concluded that the graptolites of the entire section may all belong in the *Dicranograptus clingani* Zone. Evidence from elsewhere in the Conwy area shows that the Bodeidda Mudstone, which unconformably overlies the Cadnant Shale, is Rawtheyan in age. and that there is a widespread latest Caradoc to early Ashgill hiatus at this boundary.

## Description

The cutting exposes some 155 m of south-dipping black graptolitic Cadnant Shale. Though affected by a minor fault in the lower part of the section (Figure 9.19) and locally overturned near the top, the shales are otherwise undisturbed. They are underlain by about 8 m of unfossiliferous calcareous tuffs with thin chert layers and a distinct band of pyrite nodules 1.5 m above the base. The lithological change to the Cadnant Shale is abrupt and conformable and there is only one, thin, tuff band within the shales at about 15 m above the base of the formation. The Cadnant Shale is overlain unconformably by the Bodeidda Mudstone. Wood and Harper (1962) described a section through the lower part of the shales and the top of the underlying tuffs in a temporary road cutting 800 m to the east, but there the Cadnant Shale was estimated to be only about 125 m thick. Trilobites and brachiopods from the underlying unit in the road section indicated a Woolstonian age (Upper Longvillian of Wood and Harper).

The Bodeidda Mudstones at the top of the railway section are unfossiliferous, but shelly faunas from elsewhere in the Conwy area indicate a Rawtheyan age for the formation (Price, 1984, p. 103), despite some suggestions of an earlier Ashgill or even latest Caradoc age for parts of the unit (e.g. Howells *et al.*, 1981). There is thus a considerable hiatus between this and the underlying Cadnant Shale.

## Interpretation

Lapworth (1879b) placed the graptolites from the Cadnant Shale of the railway cutting in the *Dicranograptus clingani* Zone, whereas Elles (1909) considered a much longer sequence of zones to be present and assigned the graptolites to the zones of *Climacograptus peltifer*, *Diplograptus multidentis* and *Dicranograptus brevicaulis* and *Dicranograptus clingani*. This was the first time that the names '*multidentis*' and '*brevicaulis*' had been used zonally, and thus, historically, Cadnant Cutting is the type section for what became the *multidentis* Zone (= *foliaceus* Zone in Fortey *et al.*, 1995). However, Strachan (in Wood and Harper, 1962, p. 184) concluded that there is no significant change in the graptolite faunas through the whole of the Cadnant Shale in the section and that little or none of the *multidentis* Zone is present. The presence of *D. clingani* itself in the fauna suggests that the whole formation belongs in the lower part of the *clingani* Zone; but the fauna needs to be reassessed in the light of recent work by Zalasiewicz *et al.* (1995) on the zone in South

Wales and Scotland.

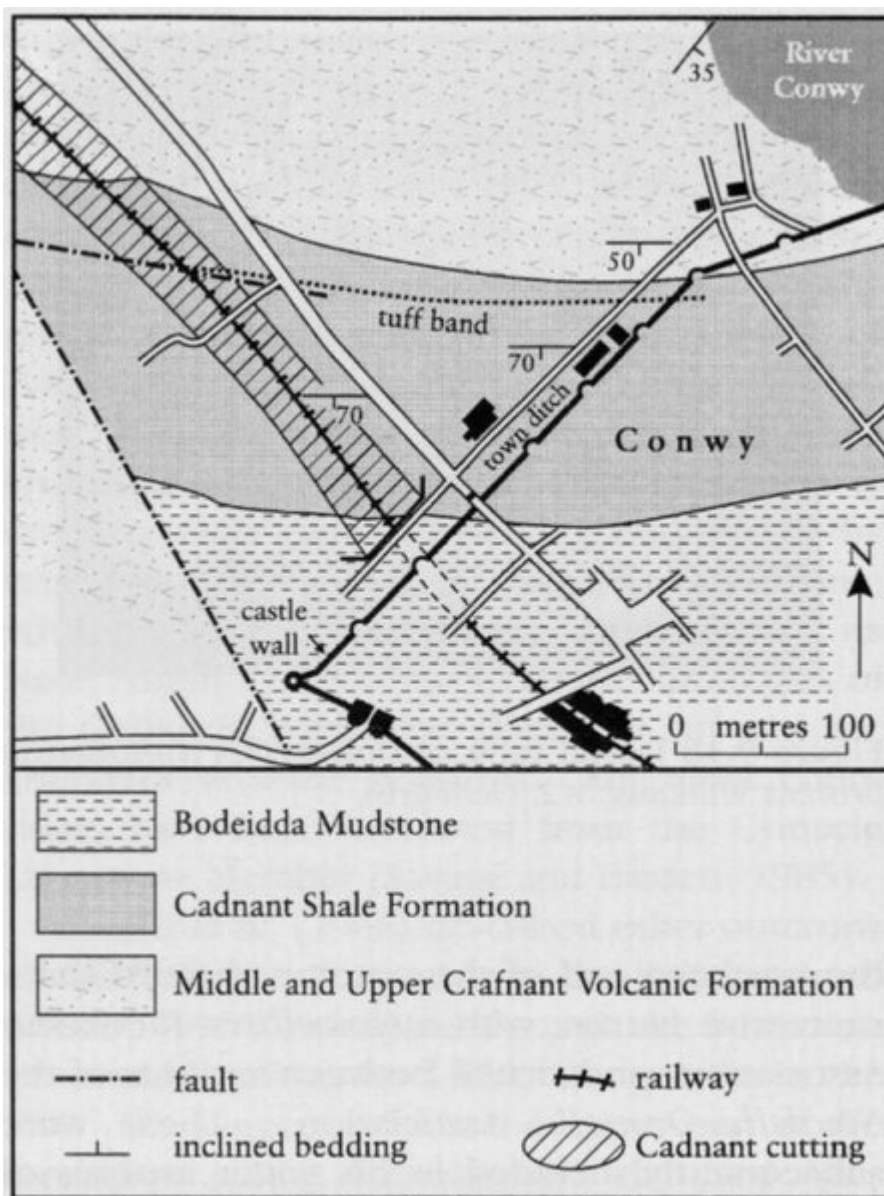
Strachan's re-interpretation of the graptolite fauna throws considerable doubt on whether any of the *multidens* Zone is present in this its historical type section but agrees with the general conclusion of Rushton and Howells (1998) that the Cadnant Shale and Nod Glas Formation are of lower *clingani* Biozone age where they overlie the Snowdon Volcanic Group of Woolstonian age; they recommended that the term 'Nod Glas Formation' should replace the term 'Cadnant Shales' and several other local names for similar upper Caradoc black shales of this age. On a regional scale, the development of lower *clingani* Zone black shales at Conwy is compatible with the development of the Nod Glas Formation over a large part of North Wales (Pratt *et al.*, 1995; Howells and Smith, 1997), although in places the shales extend to higher levels in the upper Caradoc (see site report for Gwern-y-Brain).

Price (1984, p. 103) noted considerable fossil evidence that all the basal Ashgill rocks in North Wales from Towyn to Conwy are Rawtheyan in age, indicating a latest Caradoc to early Ashgill hiatus that was termed the 'sub-Powys unconformity' by Woodcock (1990), although Pratt (1991) suggested that the Nod Glas Formation may later have acted as a decollement horizon in the deeper parts of the basin, and deposition may accordingly have continued locally across the Caradoc–Ashgill boundary. Cadnant Cutting provides an excellent section through the most northerly extent of this widespread hiatus, which probably reflects basin tectonics rather than global sea-level change.

## Conclusions

Cadnant Cutting shows a thick and relatively undeformed section through the Cadnant Shale, a lateral equivalent (or synonym) of the Nod Glas Formation elsewhere in North Wales. It thus helps demonstrate a very extensive consistency in depositional pattern in the northern part of the Welsh Basin, with a major deepening event followed in many areas by an episode of uplift and erosion.

## [References](#)



(Figure 9.19) Geological map showing the Cadnant Shale Formation and contiguous units in Cadnant railway cutting, and the eastward extension of the lower part of the succession in the temporary road section documented by Wood and Harper (1962, fig. 1).