
Chapter 10 Arenig to Caradoc of Shropshire

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Introduction

The Ordovician rocks of Shropshire form two contrasting sequences that are separated by the Precambrian rocks of the Longmynd block (Figure 10.1). Both are of great importance. The Caradoc area to the east is the original site of Murchison's (1839, p. 216) 'third Formation, or Caradoc Sandstone', and because the Caradoc Series has traditionally been based closely on the succession in this area, it has been the focus of much subsequent work. The sequence in the Shelve area to the west of the Longmynd is much thicker and the rocks exposed extend through all of the lower half of the Ordovician. They constitute a stratigraphical standard of great value, in particular for correlation between shelf and basin successions.

Shelve area

The Shelve area in west Shropshire (and part of Powys) exposes a succession about 4 km thick at the eastern edge of the Welsh Basin. This ranges virtually continuously from low in the Tremadoc to the Soudleyan Substage in the mid-Caradoc (Figure 10.2). The area (or 'inlier') is bounded to the south-east by the Linley–Pontesford Fault; east of the fault the Ordovician rocks of Pontesford are related to those of the Caradoc area (Dean and Dineley, 1961), and the Pontesford Lineament is, together with the Church Stretton Fault belt, accepted as marking the eastern edge of the Welsh Basin (Woodcock, 1984; Bluck *et al.*, 1992). Though much of the succession is representative of deep-shelf conditions, it includes shallow neritic environments at some levels, and there are Llanvirn volcanic edifices that show evidence of shallow-water erosion. It is evident therefore that there was subsidence on the Pontesford Lineament contemporaneous with deposition during the earlier half of the Ordovician.

Although Murchison (1839) described localities in the Shelve area, it was Lapworth who recognized the stratigraphical importance of the succession (Lapworth and Watts, 1894), containing as it does alternations and mixtures of shelly and graptolitic faunas. Whittard extended Lapworth's work by mapping the area and making fossil collections. He published two general reviews (Whittard, 1931, 1952a) and described the trilobites (Whittard, 1955–1967). His collections formed the basis of studies on the brachiopods (Williams, 1974) and graptolites (Strachan, 1986). After Whittard's death, W. T. Dean compiled a stratigraphical memoir and geological map based on Whittard's field maps and notebooks (Whittard, 1979), and this work includes an account of earlier research. The British Geological Survey (1991; 1994b; Cave and Haim, in press) published a more detailed map and modified the stratigraphy slightly.

The stratigraphical succession is shown in (Figure 10.2). The changes in depth and environmental conditions, with their consequent mixtures of brachiopod, trilobite and graptolite faunas, facilitate correlation between basinal successions in Wales and shelf successions such as that of the Caradoc area. The Tremadoc rocks and upward shallowing to the Arenig are seen at the Granham's Moor site (see Chapter 7). The shallow-water facies of the Moridunian and Whitlandian is represented at Mytton Dingle whereas the Fennian is seen at Bergam Quarry and Shelve Church. The lower Abereiddian is present in a deeper-water, partly graptolitic, facies in Hope Valley and the upper Abereiddian in a shallower facies at Betton Dingle. The Llandeilian is developed in a varied, partly calcareous, facies at Meadowtown Quarry. The sequence at Spy Wood and Aldress dingles exposes a long section in lower Caradoc graptolitic rocks, punctuated by the input of clastic and volcanic units, both of which locally contain shelly fossils.

[Mytton Dingle and Snailbeach](#)

[Bergam Quarry](#)

[Shelve Church](#)

[Hope Valley](#)

[Betton Dingle](#)

[Meadowtown Quarry](#)

[Spywood and Aldress Jingles](#)

Caradoc area

The Caradoc Series in south Shropshire crops out on the western edge of the Midland Platform (Bluck *et al.*, 1992) in two tracts that are separated near Hope Bowdler by upfaulted Cambrian rocks and Uriconian volcanic rocks of Precambrian age (Figure 10.1). In each tract the Caradoc rests unconformably on Precambrian to Tremadoc rocks and is overlain with unconformity by the Llandovery. The sequence in the northern tract is the thicker, but that in the southern tract is the more complete stratigraphically (Figure 10.9). According to Smith and Rushton (1993), the two tracts correspond to two basins, which they termed the Cress-age–Cardington and Onny sub-basins, each of which deepens southwards and terminates against a growth fault.

Although Murchison's (1839) description of the Caradoc Sandstone as the 'third formation' of his Silurian System had characterized the division by means of its fauna, his original account included Llandovery fossils. Nevertheless, when the fossils of Wales were studied, the Caradoc became widely recognized in the Principality, including parts that Sedgwick had ascribed to his Cambrian System. The ensuing conflict between Sedgwick and Murchison over the limits of the Silurian (Secord, 1986) was exacerbated by Murchison's 'blunder' in conflating Caradoc and Llandovery (Sedgwick, 1852), though the unconformity between the two in the Caradoc area was admittedly difficult to discern (Salter and Aveline, 1854; cf. (Figure 10.19)).

Lapworth effected a division of the 'Caradoc Sandstone' into constituent formations, and these were adopted by the Geological Survey (Pocock *et al.*, 1938; Greig *et al.*, 1968). That scheme is applied to the northern area, though Dean (1958, 1964) proposed a different subdivision for the lower units in the southern area (Figure 10.9) and (Figure 10.10).

The succession contains shelly faunas throughout, and Bancroft's (1933, 1945) detailed study of these allowed him to characterize seven stages (and many local zones, based mainly on brachiopods) within the type Caradoc Series. Dean (1958) gave a review of Bancroft's stages and found them of value in northern England (Dean, 1959a), though they are more difficult to apply in Wales and appear too detailed for use in wider correlation. In their review of Ordovician chronostratigraphy, Fortey *et al.* (1995) reduced the Bancroft stages to substages and grouped them into four larger units of wider utility (see (Figure 6.2) and (Figure 10.9)). Hurst (1979a) reviewed the ecological setting of the shelly faunas and recognized several upper Caradoc benthic associations (see also Lockley, 1983). The type Caradoc contains a succession of trinucleid trilobites (Dean, 1960; Owen and Ingham, 1988) that has proved of particular value in correlation, both in Wales and northern England.

The localities are shown in (Figure 10.1) (numbers 11–16). The transgressive base of the succession, with its shallow-water faunas, is shown at Coston Farm. The Burrellian Stage is seen resting on Precambrian rocks at Hope Bowdler, and, in the only site in the northern Caradoc area, a deeper-water, partly graptolitic facies of the Costonian and Burrellian rests on Tremadoc shales at Coundmoor Brook, Harnage (Figure 10.13). Soudley Quarry shows strata at the junction of the Burrellian and Cheney stages, and Marshwood has the stratotype base of the Streffordian Stage. The Onny River site is the type locality for the Actonian and Onnian substages of the Streffordian and includes the historically elusive unconformity between the Caradoc and Llandovery.

[Coston Farm](#)

[Coundmoor Brook, Harnage](#)

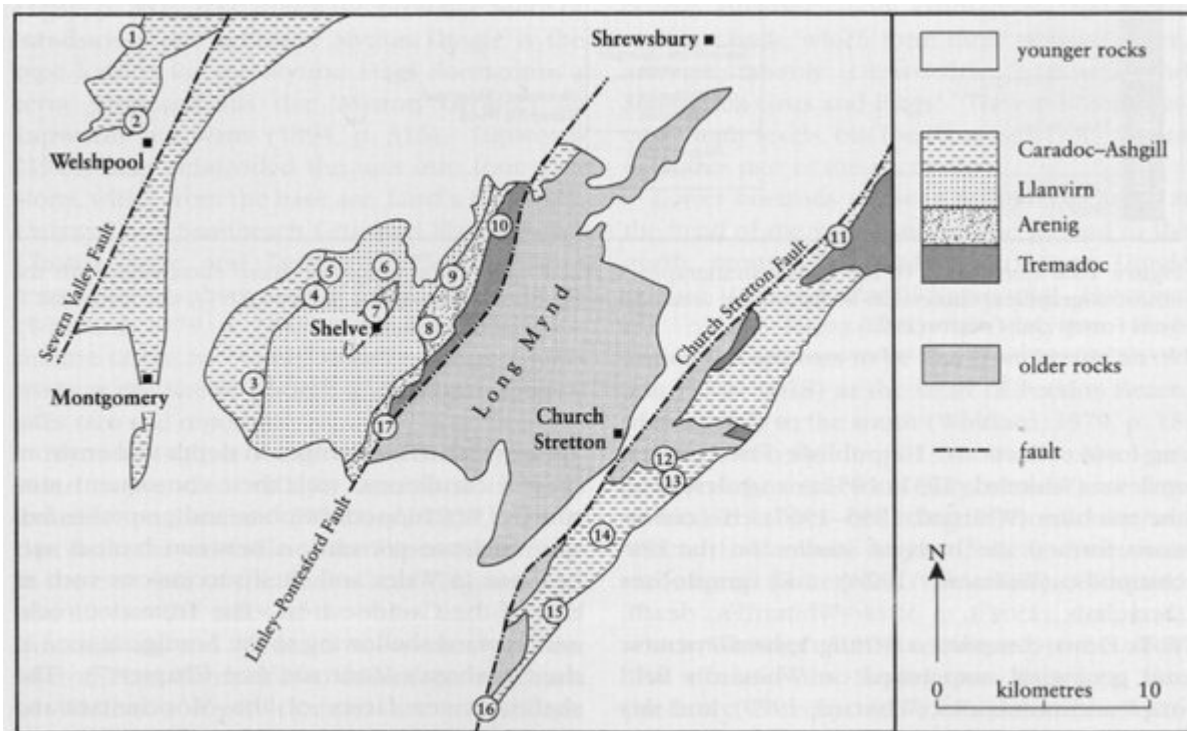
[Hope Bowdler Road Section](#)

[Soudley Quarry](#)

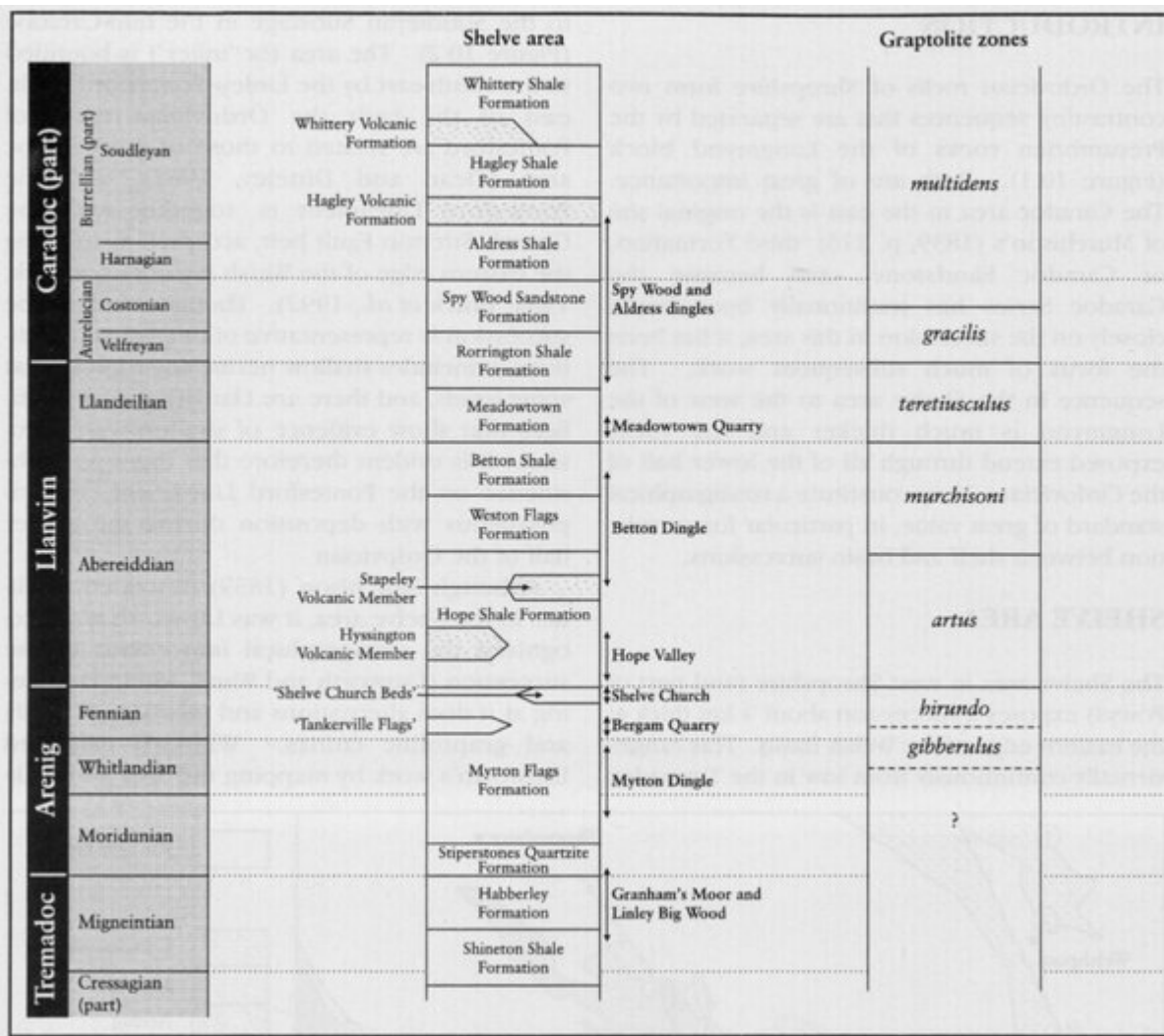
[Marshwood](#)

[Onny River](#)

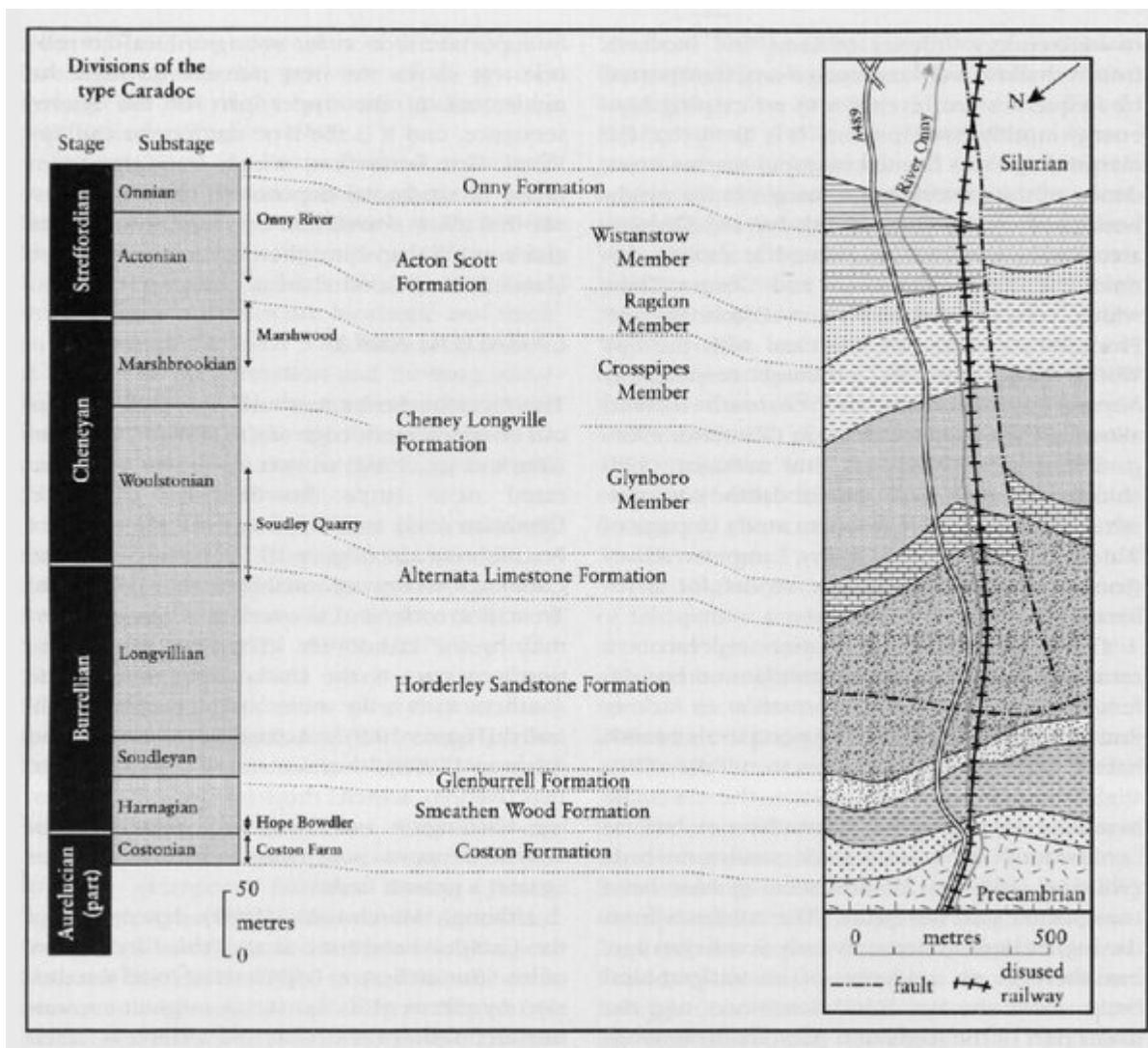
[References](#)



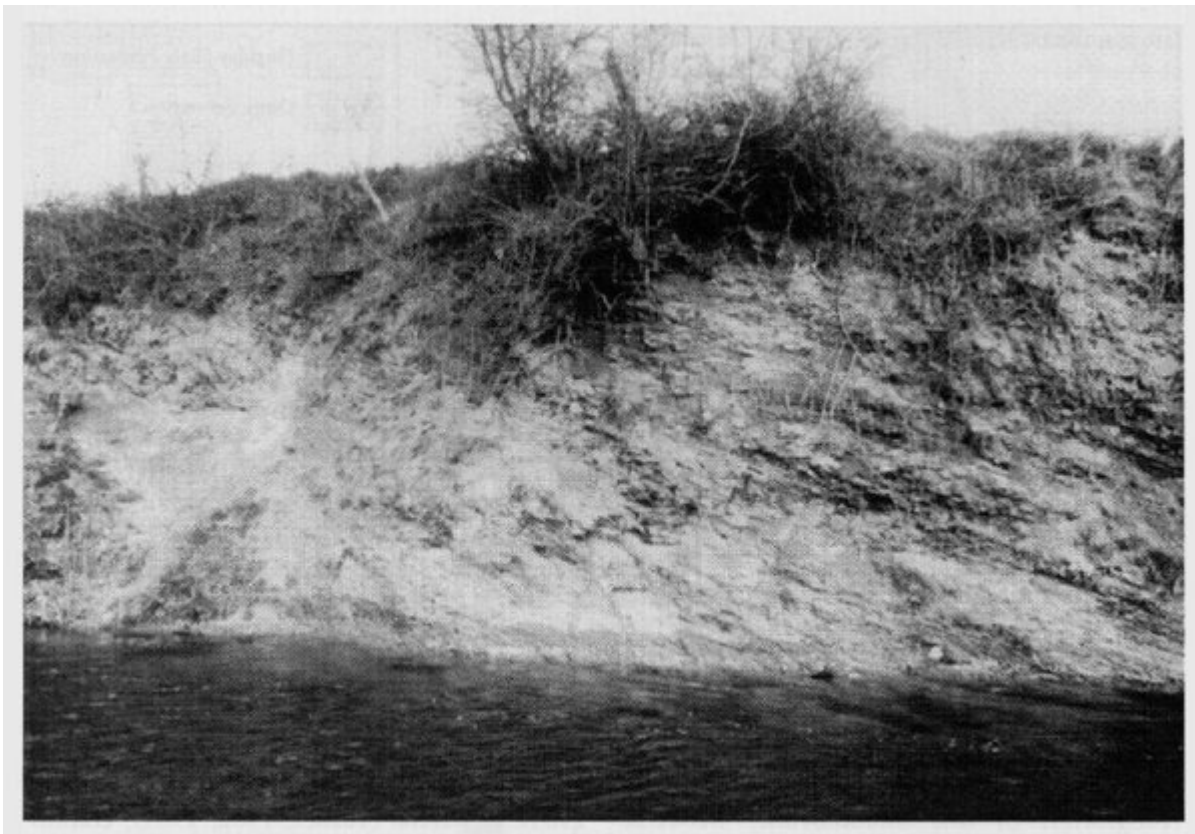
(Figure 10.1) Map showing the distribution of Ordovician rocks in south Shropshire and eastern central Wales, from British Geological Survey (1994c). GCR sites as follows: 1, Gwern-y-brain; 2, Trilobite Dingle; 3, Spy Wood and Aldress dingles; 4, Meadowtown; 5, Betton Dingle; 6, Hope Valley; 7, Shelve Church; 8, Bergam Quarry; 9, Mytton Dingle; 10, Granham's Moor (Tremadoc, see Chapter 7); 11, Coundmoor Brook (Harnage); 12, Hope Bowdler; 13, Soudley Quarry; 14, Marshwood; 15, Onny River; 16, Coston Farm; 17, Linley Big Wood (Tremadoc, see Chapter 7).



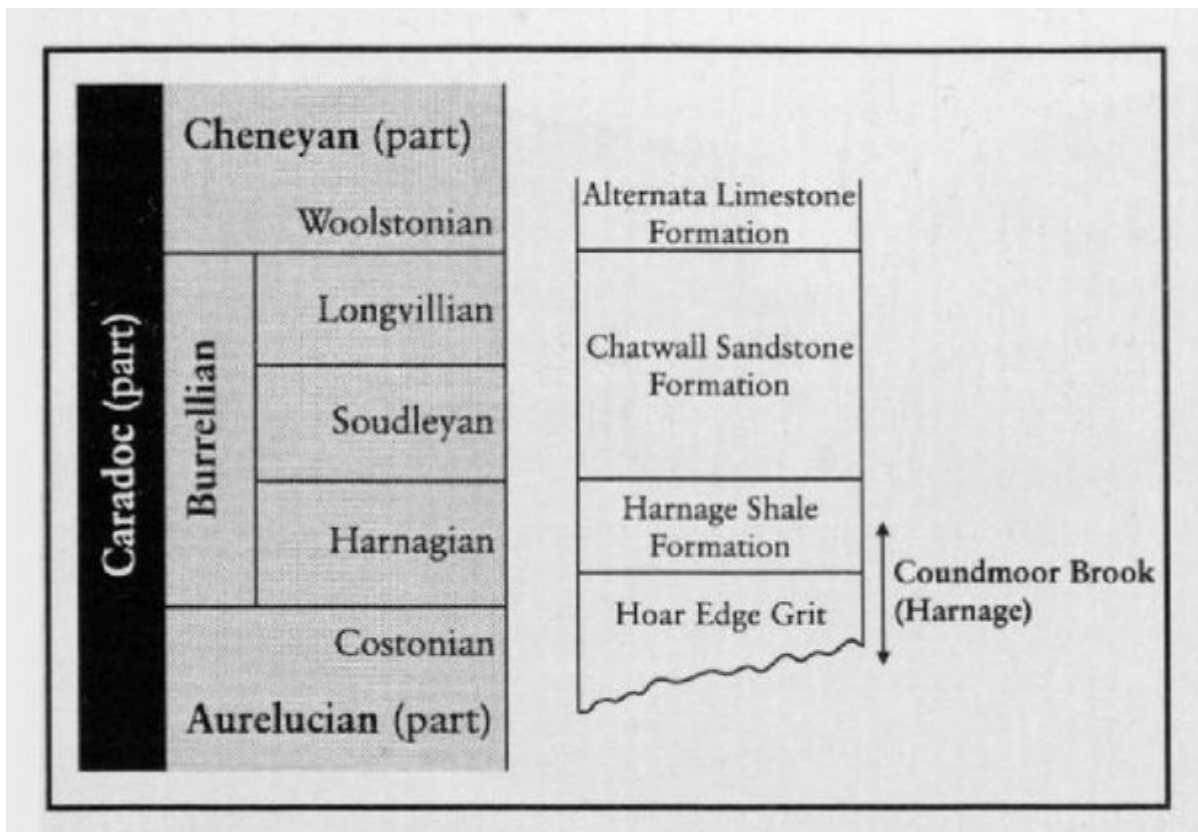
(Figure 10.2) Correlation of the chronostratigraphical standard and the graptolite zonal succession with the lithostratigraphical succession in the Shelve area, following British Geological Survey (1991); the Tremadoc is from Fortey and Owens (1992).



(Figure 10.9) Geological map of the Onny Valley showing the Caradoc succession in the southern Caradoc area, based on Savage and Bassett (1985, fig. 3), with stratigraphical amendments proposed by Owen and Ingham (1988) and Fortey et al. (1995).



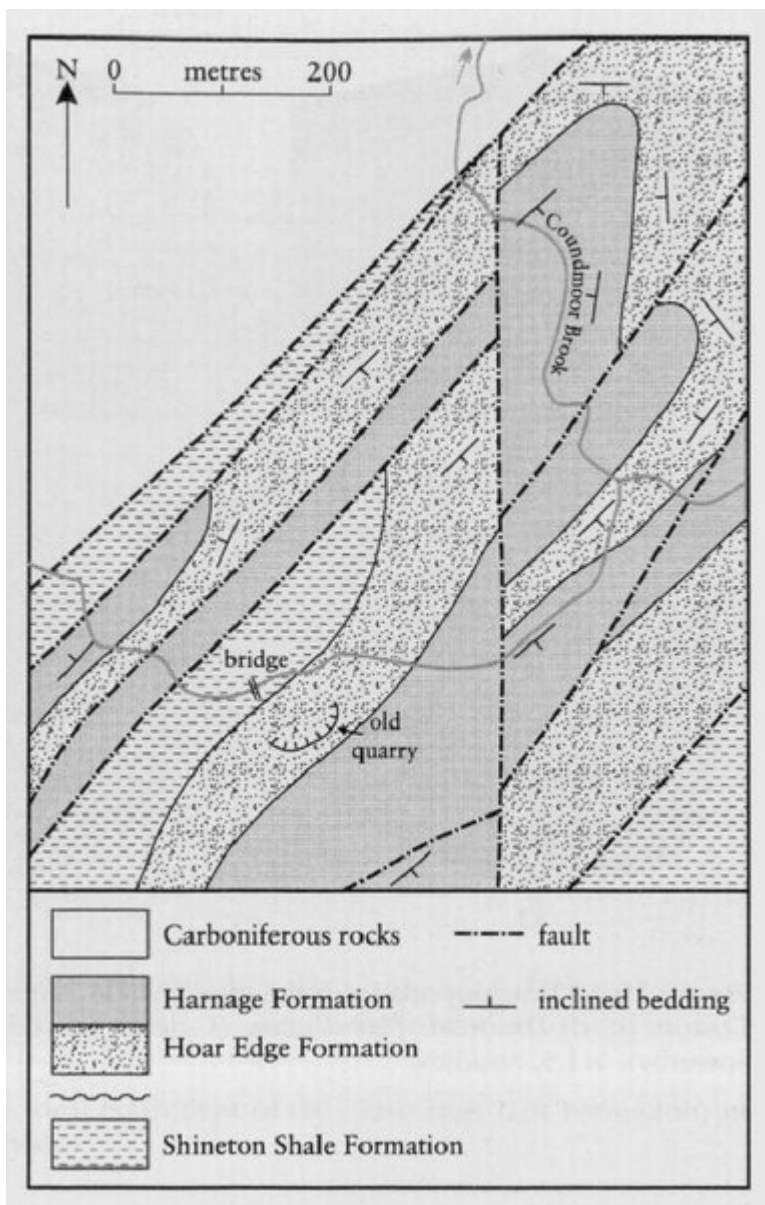
(Figure 10.19) The cliff section at the eastern end of the Onny River section, showing how difficult it is to see the slight angular unconformity of the Lower Silurian (upper Llandovery) Hughley Shale Formation above the shales of the uppermost Caradoc Onny Formation (Caradoc, Streffordian, Onnian Substage). (Photo: J. K. Ingham.)



(Figure 10.10) Stratigraphical succession for part of the northern Caradoc area, showing the stratigraphical range of the Coundmoor Brook site near Harnage.

British graptolite zonation	Chronostratigraphy (with stages and substages)	Isotopic dates			
<i>'Glyptograptus' persculptus</i>	Avalon				
<i>Climacograptus? extraordinarius</i>			Hirnantian		
<i>Dicellograptus anceps</i> <i>Paraorthograptus pacificus</i> <i>Dicellograptus complexus</i>			Rawtheyan	446 ± 2 ¹	
<i>Dicellograptus complanatus</i>			Cautleyan		
<i>Pleurograptus linearis</i>			Pusgillian		
Caradoc					
			<i>Dicranograptus clingani</i> <i>Dicellograptus morrisi</i> <i>Ensigraptus caudatus</i>	Streffordian Onnian Actonian	
			<i>Diplograptus multidentis</i>	Cheneyan Marshbrookian Woolstonian	448 ± 4 ² , or 457 ± 2 ¹ , or 456 ± 2 ⁵
			<i>Nemagraptus gracilis</i>	Burrellian Longvillian Soudleyan Harnagian	
			<i>Hustedograptus teretiusculus</i>	Aurelucian Costonian Velfreyan	
Llanvirn					
			<i>Didymograptus murchisoni</i>	Llandeilian	460 ± 2 ⁵
			<i>Didymograptus artus</i>	Aberciddian	← 465 ± 2 ¹ ← 462 ± 3 ² , or ← 466 ± 2 ¹
Arenig					
			<i>Expansograptus birundo</i>	Fennian	
			<i>Isograptus caduceus gibberulus</i>	Whitlandian	
			<i>Didymograptus simulans</i>	Moridunian	← 471 ± 3 ²
Tremadoc					
			<i>Didymograptus varicosus</i>	Moridunian	← 471 ± 3 ²
			<i>Tetragraptus phyllograptoides</i>	Migneintian	483 ± 1 ³
			<i>Araneograptus murrayi</i>	Migneintian	483 ± 1 ³
<i>Trilobite zones (no graptolites)</i> <i>Angelina sedgewickii</i> <i>Conophrys salopiensis</i>	Migneintian	483 ± 1 ³			
<i>Adelograptus tenellus</i>	Cressagian				
<i>Rhabdinopora flabelliformis</i> s.l.		<491 ± 1 ⁴			

(Figure 6.2) Chronostratigraphy of the Ordovician of England and Wales, correlated with the graptolite zonation. Selected ages (in millions of years) from the study of radioactive isotopes are shown to the right. Sources: 1, Tucker et al. (1990); 2, Compston and Williams (1992); 3, Landing et al. (1997); 4, Davidek et al. (1998); 5, Tucker and McKerrow (1995).



(Figure 10.13) Geological map of the area around Coundmoor Brook, south-west of Harnage, after Pocock et al. (1938, fig. 28). For location, see (Figure 7.10).