Chatburn Bypass, Lancashire

[SD 773 440]–[SD 774 445]

Introduction

The Chatburn Bypass GCR site lies in a cutting on the A59 trunk road immediately east of Chatburn village and 4 km north-east of Clitheroe [SD 774 445]–[SD 773 440] (see (Figure 6.7), The Knolls GCR site report, this chapter). A thick section of the Chatburn Limestone Group is exposed, comprising a substantial part of the Bankfield East Beds and the base of the overlying Bold Venture Beds (Figure 6.2). The site is particularly important since it was said to illustrate the regressive phase of Ramsbottom's (1973) 'Major Cycle 1' and the early part of 'Major Cycle 2', and was chosen by George *et al.* (1976) to be the stratotype for the Chadian Stage, named after St Chad from whom Chatburn also derives its name. The biostratigraphy of the section has been described and discussed by Riley (1993, 1995) and the sedi-mentology described by Barraclough (1983).

Description

The complete section on both sides of the road cutting totals 186.2 m in thickness and is made up of 163.1 m of Bankfield East Beds, overlain successively by the Four Foot Shale (1.4 m) and 21.7 m of Bold Venture Beds (Riley, 1995). Strata dip southwards on the southern limb of the Clitheroe Anticline. The rocks are mostly pale grey- or brown-weathering fine bioclastic limestones which are dark grey or black when fresh. Individual limestones are typically between 0.2 m and 0.5 m thick; texturally they are packstones and wackestones. They contain significant argillaceous material and pyrite, and emit a sulphurous odour when struck. Mudstones are interbedded with the limestones and both are bioturbated by chondritiform and thallassinoid burrow systems. Mudstones are mostly thin, many of them no more than partings between adjacent limestones, but there are some thicker units, including the Four Foot Shale near the top of the succession. Macrofossils in the limestones are sparse and are mainly crinoid ossicles, solitary corals and chonetoid, spiriferoid and pro-ductoid brachiopods with some in-situ colonies of *Syringopora.* Fenestellid bryozoans are common in some of *the* interbedded mudstones (Riley, 1995). The algal limestones mentioned by Ramsbottom (1973) and George *et al.* (1976) are oncoid-bearing horizons that are found at a number of levels, particularly in the lower part of the succession (Figure 6.5).

Unforunately, there is confusion over the exact siting of the Chadian stratotype. According to George *et al.* (1976), it is exposed on the west side of the cutting, 80 m from its northern end and 'is taken at the first change in lithology below the entry of the eostaffellid foraminiferal genus *Eoparastaffella*'. They also took this to be the junction between the Horrocksford Beds and the Bankfield East Beds. The lithological change they describe is from fine-grained and algal limestone below, to crinoidal limestone interbedded with calcareous mudstones above. However, in a photograph published as part of a field guide (Ramsbottom, 1981), the stratotype is marked on the eastern side of the cutting. Furthermore the boundary is shown at a different level on the accompanying log to that shown on the photograph (Riley, 1995). Since it is the only published illustration of the stratotype, the photograph has been taken as the definitive evidence for the position of the boundary (Riley, 1995). A further illustration of this boundary is shown in (Figure 6.6).

The siting of the stratotype is problematical on two counts. Firstly, the lithological change described by George *et* al. (1976) does not exist in the Chatburn Bypass cutting. Their description is based on the distinction between the Horrocksford Beds and the Bankfield East Beds made by Earp *et al.* (1961) elsewhere in the Clitheroe area, but as noted by Barraclough (1983) and Riley (1995), crinoids and oncoids are both present above and below the boundary defined in the Chatburn Bypass section, and there is little change in the proportion of interbedded mudstone (Figure 6.5). Largely for these reasons, Riley (1995) regarded the lower part of the succession in the cutting as being entirely within the Bankfield East Beds. Secondly, the report of *Eoparastaffella* has not been confirmed by subsequent workers (Fewtrell *et al.,* 1981a,b; Riley, 1990a, 1993, 1995). Its first confirmed appearance is some 300 m higher in the succession, in the Hodder Mudstone Formation (Riley, 1990a). A detailed appraisal of the foraminiferal biostratigraphy of the succession

has been carried out by Riley (1995). The assemblages, which include three species described for the first time, can be correlated with the late Tournaisian Cf4a1 Sub-zone (see (Figure 1.4), Chapter 1). Riley (1995) stressed that there is no biostratigraphical identity to the stage boundary.

Interpretation

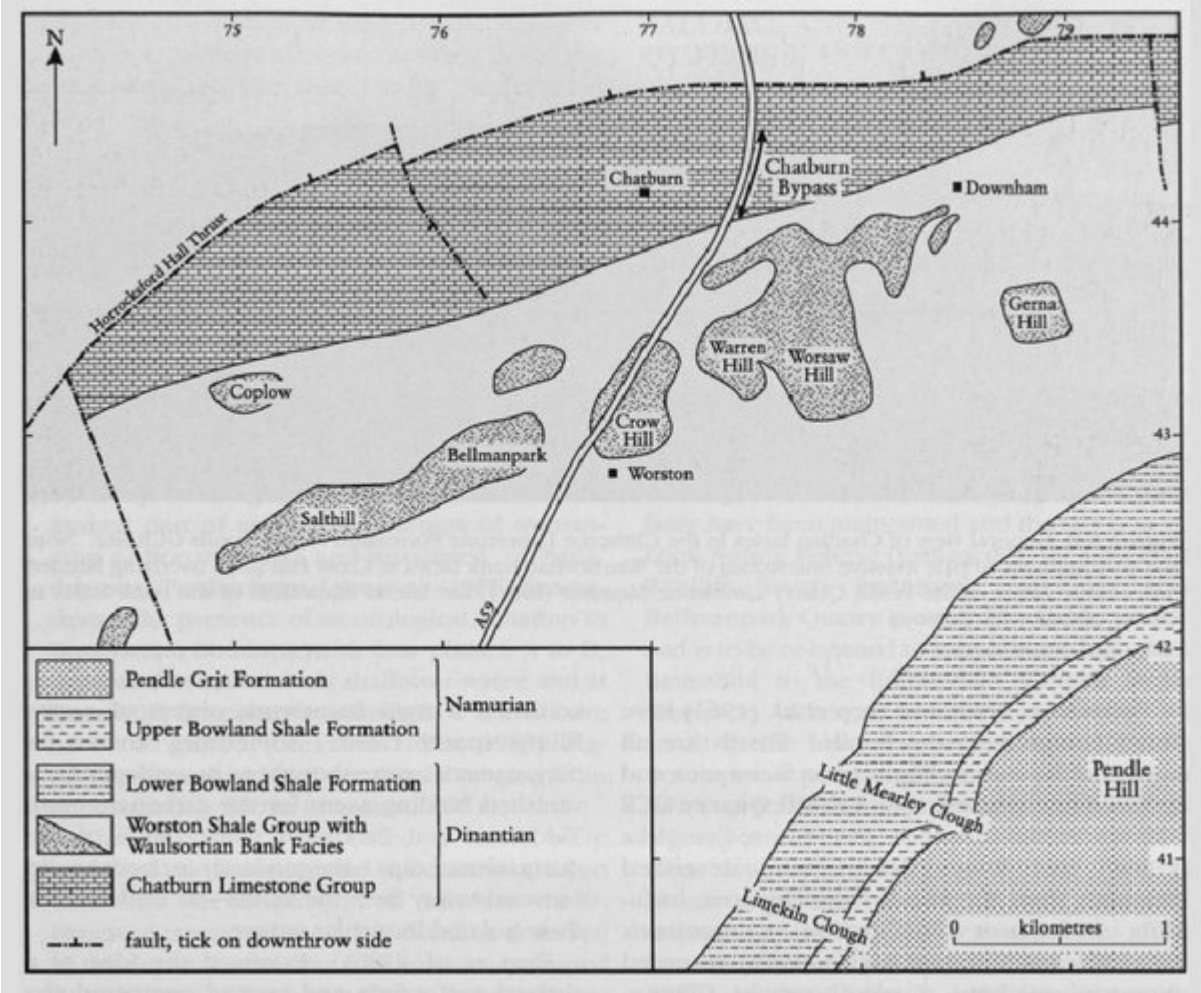
During early Dinantian times, the floor of the Craven Basin was a southerly dipping ramp (Gawthorpe, 1986). The Chatburn Limestone Group at this site represents the deposits of the more distal parts of the ramp, below wave-base, with periodic influxes of mud from river systems draining the Askrigg Block (Barraclough, 1983). Riley (1995) noted very little evidence for variations in water depth and inferred that sediment accumulation kept pace with subsidence. There is no evidence for the shallowing marking the regressive phase at the top of Major Cycle 1, defined by Ramsbottom (1973). The presence of bioturbation suggests an oxygenated sea floor, but the abundance of pyrite suggests that anoxic conditions prevailed in shallow burial environments.

It is clear from the discussion above that this locality is not a suitable choice for a stratotype. As defined, there is no distinction on lithological or biostratigraphical grounds between the late Courceyan and early Chadian successions. Correlations on the basis of the evidence from this section are therefore not possible and, as stated unequivocally by Riley (1995), 'unqualified use of the stage is of little value'. Riley (1995) pointed out that George *et al.* (1976) had intended their stage boundary to be coincident with the appearance of *Eoparastaffella,* which would also mark the base of the Viséan Series. Riley (1990a) used the term 'late Chadian' for the interval between the appearance of *Eoparastaffella* and the first occurrence of primitive archaediscids. Clearly, it would be most appropriate to abandon the Chadian Stage and to propose a new stage for the 'late Chadian' interval, with the possibility of also defining a new stage within the late Tournaisian interval (Riley, 1995).

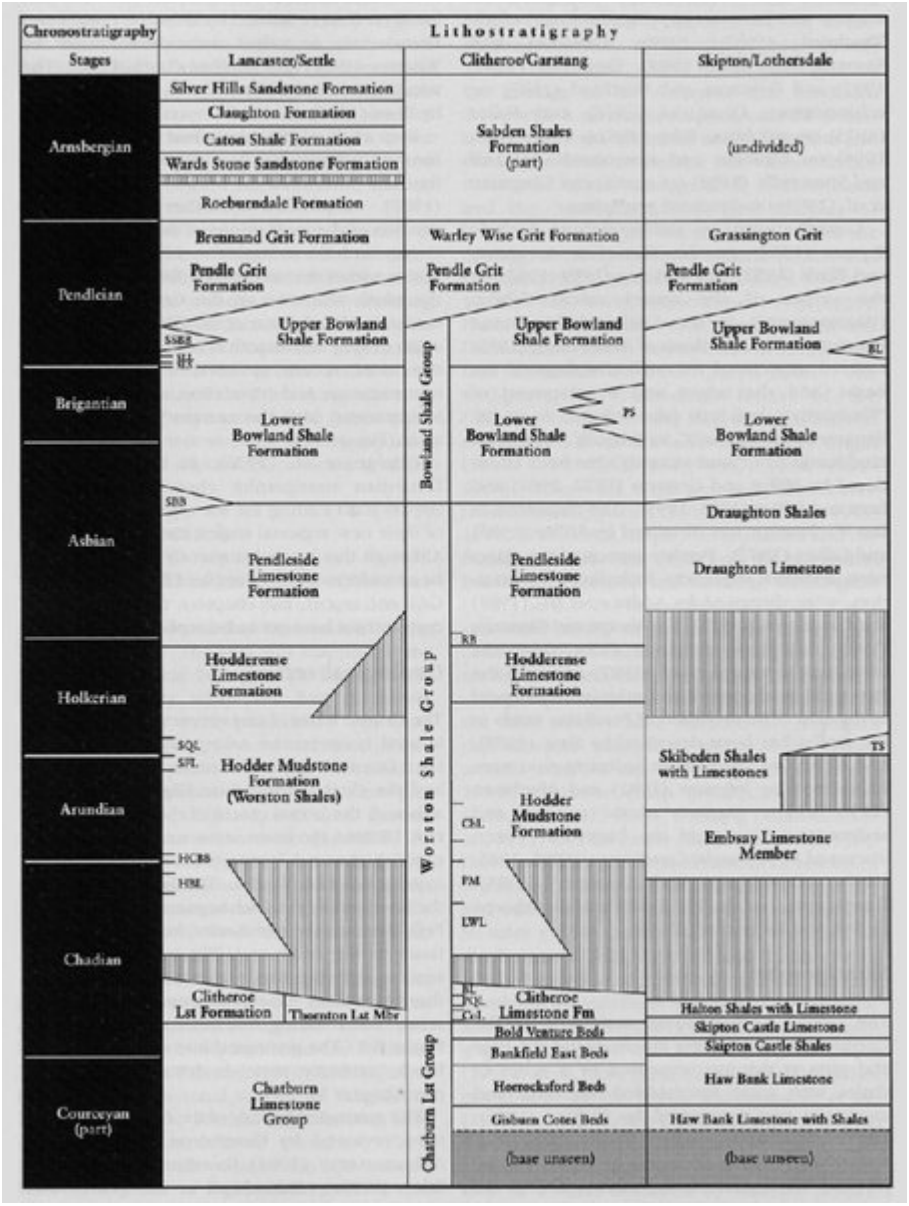
Conclusions

Despite the serious concerns regarding the suitability of this site as the Chadian stratotype, which may eventually lead to its abandonment, the status of the Chatburn Bypass as a Lower Carboniferous GCR site remains significant. It exposes the best section of the Chatburn Limestone Group outside working quarries and provides an important record of mid- to outer-ramp sedimentation during early Dinantian times of the Craven Basin. The site also provides an invaluable record of late Tournaisian foraminiferal faunas and is the type locality for a number of species.

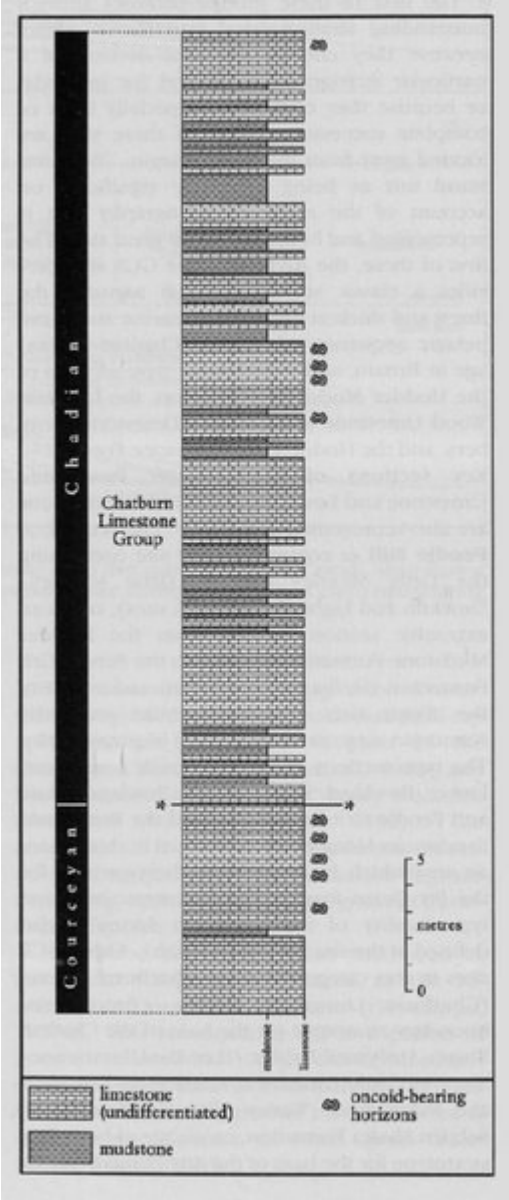
References



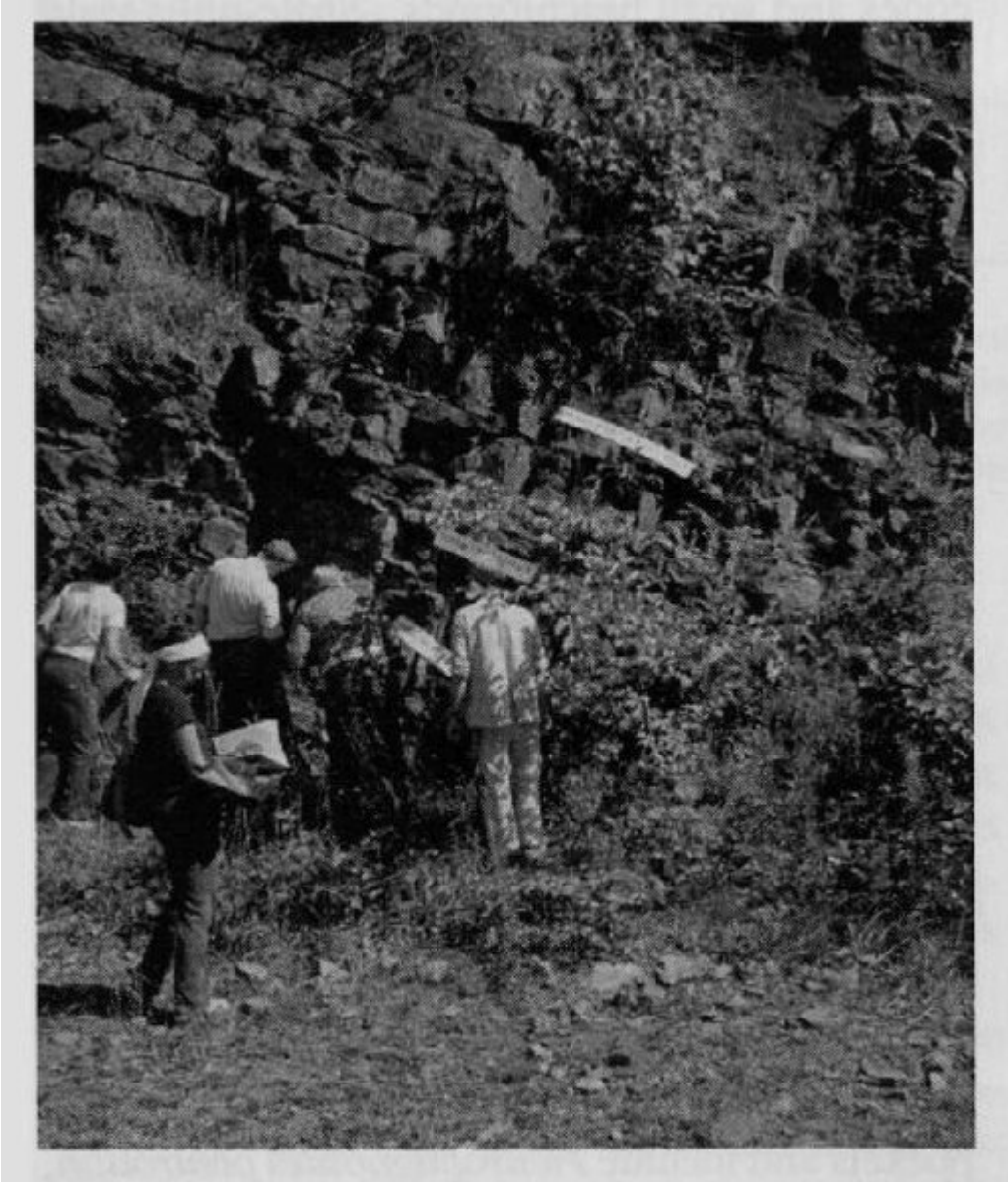
(Figure 6.7) Geological map of the area to the east of Clitheroe showing the location of the exposed eroded remnants of the Waulsortian bank facies at The Knolls GCR site (Crow Hill to Gerna Hill) based on a [British] Geological Survey map of the area (Institute of Geological Sciences, 1970). The locations of several other GCR sites in the region (Chatburn Bypass, Salthill and Bellmanpark Quarries, Coplow Quarry, Pendle Hill) are also shown.



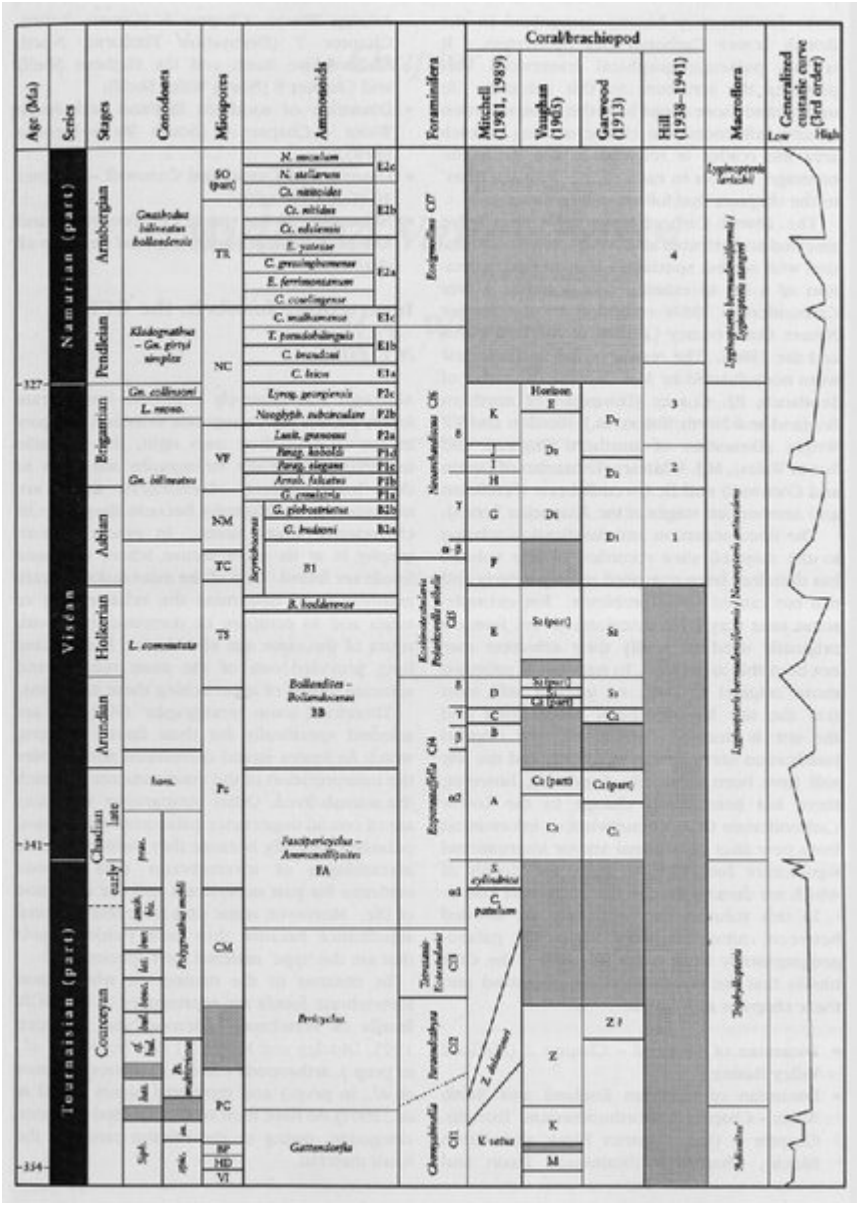
(Figure 6.2) Simplified stratigraphical chart for the Lower Carboniferous succession of the Craven Basin. (HBL — Hetton Beck Limestone Member; HCBB Haw Crag Boulder Bed; SFL — Scaleber Force Limestone Member; SQL — Scaleber Quarry Limestone Member; SBB — Scaleber Boulder Bed; SLS — Sugar Loaf Shales; SLL — Sugar Loaf Limestone; SSBB School Share Boulder Bed; CoL — Coplow Limestone Member; PQL — Peach Quarry Limestone Member; BL — Bellman Limestone Member; LWL — Limekiln Wood Limestone Member; PM — Phynis Mudstone Member; ChL — Chaigley Limestone Member; FIB — Rad Brook Mudstone Member; PS — Pendleside Sandstones Member; TS — Twiston Sandstone Member; BL — Berwick Limestone.) Areas of vertical ruling indicate non-sequences. Not to scale. Compilation based on Hudson and Mitchell (1937), Metcalfe (1981), Arthurton et al. (1988), British Geological Survey (1989), Riley (1990a, 1995), Aitkenhead et al. (1992), Brandon et al. (1995, 1998).



(Figure 6.5) Sedimentary log of the Chadian stratotype showing the position of Ramsbottom's (1973) 'Major Cycle 1–2 boundary' (defined by asterisks) and the location of the Courceyan–Chadian boundary as envisaged by George et al. (1976). Based on Barraclough (1983) and Leeder (1988). See text for further discussion.



(Figure 6.6) The Chadian boundary stratotype at the Chatburn Bypass GCR site, as originally defined by Ramsbottom (1981) at the junction between the Horrocksford Beds (below the middle worker) and the Bankfield East Beds (above the middle worker) (Chatburn Limestone Group). See text for further details. (Photo: JNCC.)



(Figure 1.4) Chronostratigraphical and biostratigraphical classification schemes for the Lower Carboniferous Subsystem. After Riley (1993, fig. 1) with additional information for the Pendleian and Arnsbergian stages supplied by the same author. Absolute age data from Guion et al. (2000) based mainly on information by Lippolt et al. (1984), Hess and Lippolt (1986), Leeder and McMahon (1988) and Claoue-Long et al. (1995). Ammonoid abbreviations used in this figure: N. — Nuculoceras; Ct. — Cravenoceratoides; E. — Eumorphoceras; C. — Cravenoceras; T. — Tumulites; Lyrog. — Lyrogoniatites; Neoglyph. — Neoglyphioceras; Lusit. — Lusitanoceras; Parag. — Paraglyphioceras; Arnsb. — Arnsbergites; G. — Goniatites; B. — Bollandoceras. Conodont abbreviations used: Gn. — Gnathodus; Gn. collinsoni — Gnathodus girtyi collinsoni; L. mono. — Lochriea mononodosa; L. — Lochriea; horn. — Gnathodus homopunctatus; prae. — Mestognathus praebeckmanni; and,. — Scaliognathus anchoralis; bis. — Polygnathus bischoffi; bur. — Eotaphrus burlingtonensis; lat. — Doliognathus latus; bout. — Dollymae. bouckaerti; bul. — Eotaphrus bultyncki; has. — Dollymae bassi; siph. — Siphonodella; Ps. — Pseudopolygnathus; in. — Polygnathus inornatus; spit. — Polygnathus spicatus. Stipple ornament shows interzones (conodonts and miospores) or non-sequences (brachiopods).