Comley Quarry

[SO 4845 9647]

Introduction

Comley Quarry is a historic locality of international significance. It shows a Comley–St David's (traditionally Lower–Middle Cambrian) contact, where strata with olenellids (*Callavia*) are overlain by beds with Para-doxididae. The intervening Comley Limestones, originally observed here but more completely known from an excavation nearby, contain *Protolenus* faunas of debated Lower–Middle Cambrian age and are the type strata for numerous genera and species, some of which are of wide or intercontinental distribution. Several non-sequences or paraconformities have been detected within a mere 2–3 m of strata.

The Cambrian rocks around Comley and Caer Caradoc are poorly exposed. They are famous, however, for their faunal succession, worked out by Cobbold by means of excavations (Cobbold, 1927, p. 553) and described in several papers (listed in Rushton, 1974, p. 115). The starting point for Cobbold's investigations was Comley Quarry [SO 4845 9647], which is one of the few permanent exposures of the Cambrian in the Comley area and which shows a contact between the Comley and St David's Series (Lower and Middle Cambrian).

In the 1880s, at the time when the debate about the relative ages of Olenellid and Paradoxidid faunas was being resolved, Lapworth (1888, 1891) reported the Olenellid trilobite *Callavia callavei* (Lapworth) from Comley Quarry and later described *Paradoxides groomi* Lapworth from the same place. To clarify the stratigraphical relationships of these two trilobite occurrences, Cobbold investigated Comley Quarry in detail and also made an excavation (his 'Excavation No. 2') some 200 m along strike to the south. He collected large faunas from the various beds encountered and described the results in a series of papers (Cobbold, 1910, 1911, 1921, 1931, 1936). An important result was the identification of a *Protolenus* fauna stratigraphically between *Callavia* and *Paradoxides.* In 1933 Cobbold described Comley Quarry and his Excavation No. 2 as they appeared when best exposed (Figure 5.3), giving the following general succession.

Quarry Ridge Grit (Bal)	
Coarse quartzose glauconitic sandstone, calcareous and conglomeratic at base	6 m
Lapworthella Limestone (Ad)	
Very dark-grey, composed of phosphatic material with quartz grains; locally thinning out	up to 15 cm
Protolenus Limestone (Ac5)	
Pale-grey fossiliferous limestone, dark and phosphatic where fossils are rarer	about 15 cm
Strenuella Limestone (Ac4)	
Red limestone with quartz grains and a phosphatic matrix	about 25 cm
Eodiscus bellimarginatus Limestone (Ac3)	
Phosphatic sandy limestone	about 55 cm
Red *Callavia* Sandstone ('Limestone') (Ac2)	
Nodular red micaceous and glauconitic calcareous sandstone	about 75 cm
Lower Comley Sandstone (Ab4)	
Green, fine-grained, micaceous glauconitic sandstone	> 15 m

Comparable sequences were detected at the Cwms, a location SSW of Comley, and in the Wrekin area (Cobbold and Pocock, 1934). Lithological details are summarized in Rushton (1974, p. 96), Raw (in Cobbold, 1931, p. 502) gave petrographic descriptions, and Greig *et al.* (1968) have given a general account of the geology of the area.

Description

Comley Quarry

The west side of Comley Quarry shows 2–3 m of green, flaggy lower Comley Sandstone (Ab4), dipping due east at 73° (Figure 5.3)a. Formerly these beds were better exposed, and Cobbold saw up to 15 m of strata in old workings. These beds are almost unfossiliferous but have yielded one or two specimens of the bradoriid *Aluta ulrichi*'(Cobbold, 1936), now referred to *Ovaluta salopiensis* (Cobbold) by Williams and Siveter (1998). The sandstones pass up into the 'Olenellus Limestone', renamed 'Red *Callavia* Sandstone' (Ac2) by Raw (1936). It is a nodular calcareous sandstone about 75 cm thick, containing glauconite and detrital matter in a calcareous and ferruginous matrix; the petrography was described by Raw (in Cobbold, 1931). Red *Callavia* Sandstone is highly fossiliferous, and about 30 taxa are described (Cobbold, 1921, p. 370; Cobbold, 1931, 1936; Raw, 1936), among them *Rhombocorniculum* (formerly *Helenia*) *cancellatum* (Cobbold), *Paterina labradorica* (Billings), *Callavia callavei, Hebediscus attleborensis* (Shaler and Foerste) and species of *Micmacca;* the latter were discussed in 1934 by Lake (1906–1946, p. 172).

Overlying the Red *Callavia* Sandstone are beds of the Comley Limestones, Ac3, Ac4 and Ac5, together about 0.5 m thick. Apparently all three units are present and have yielded a few of their typical fossils, but the section is disturbed by faulting and a better section is available at Excavation No. 2 (see below). Adhering to the top of the Comley Limestones is the thin, dis continuous bed of *Lapworthella* Limestone (Ad). This is a calcareous bed, commonly dark grey, containing glauconite and much phosphate, and showing algal structures (Danielli in Rushton *et al.,* 1988). Comley Quarry is one of the principal localities for the fauna of this unit, which includes *Acrothyra* cf. *sera* Matthew, *Hyolithellus micans* Billings, *Lapworthella nigra* Cobbold, and *Rhombocorniculum cancellatum.*

The lowest division of the upper Comley Sandstone, the Quarry Ridge Grits (Bal), overlies the Comley Limestones with apparent conformity. The base is variable (Cobbold, 1933, p. 473) and may include a discontinuous phosphatic layer 1–2 cm thick with trilobite fragments (*Kootenia* [*Dorypyge*] *lakei* (Cobbold) and *Paradoxides* sp.). A basal conglomerate about 0.5 m thick follows: it has a coarse glau-conitic sandy and calcareous matrix and contains clasts of the older Cambrian formations and pebbles of Precambrian(?) rocks. The calcareous matter occurs as 'clots' (Cobbold, 1911, p. 283). This bed is the source of the original material of *Paradoxides* (*sensu lato*) *groomi, Kootenia lakei* and other species (Cobbold, 1921, p. 372). In 1933 Cobbold recorded about 5 m of Quarry Ridge Grits overlying the conglomerate and noted that the base of the succeeding Quarry Ridge Shales (Ba2) was exposed.

Excavation No. 2

This exposure 180 m south of Comley Quarry showed part of the succession exposed in the quarry, with the important difference that the Comley Limestones are less disturbed (Figure 5.4).

The Red *Callavia* Sandstone (Ac2) yielded some of the typical fossils but was not as intensively worked as in the quarry. It is succeeded by the *Eodiscus bellimarginatus* Limestone (Ac3), a pale limestone containing much sandy matter and glauconite, the fauna from which was listed by Cobbold in 1936 (p. 233). The *Strenuella* Limestone (Ac4), which follows, is a reddish limestone with a fine detrital component, glau-conite and phosphate, and the overlying *Protolenus* Limestone (Ac5) is a pale bioclastic limestone with glauconite and much phosphate, but little detrital matter. The faunas from the latter units were listed by Cobbold (1921, p. 371). Excavation No.2 was the principal source for all these faunas, amounting to about 50 taxa, of which nearly half are from the *Protolenus* Limestone.

When Excavation No. 2 was first opened the *Lapworthella* Limestone (Ad) was not detected, but in 1929 it was revealed as a continuous bed 10–15 cm thick (Figure 5.3)b. Both Ac5 and Ad are cut cleanly by a fault and the Quarry Ridge Grits follow with paraconformity (Cobbold, 1933).

Interpretation

The strata at Comley Quarry and Excavation No. 2 represent slow intermittent deposition in shallow-water environments. Successive units show a decrease in clastic input and an increase in phosphates; each unit contains a distinct fauna and is separated from contiguous units by hiatuses in deposition.

The meaning of the terms 'Lower' and 'Middle' Cambrian are uncertain, because in different parts of the world different levels are chosen for the Lower–Middle Cambrian Boundary (Cowie *et al.,* 1972, p. 7). Traditionally trilobites referred to *Olenellus* (*sensu lato*) were regarded as Lower Cambrian and *Paradoxides* (*sensu lato*) as Middle Cambrian, and. this concept became applied almost axiomatically to the families Olenellidae and Paradoxididae. Opik (1966) pointed out a biostratigraphical hiatus between traditional *Olenellus* Zone and *Paradoxides*-bearing strata, discussed the classification of the intervening *Protolenus* Zone and *Paradoxides*-bearingstrata, and considered the classification of the intervening *Protolenus* Zone and Ordian Stage. Subsequently Geyer (1990) summarized evidence showing that in Morocco olenellids (but not *Olenellus* itself) range higher than the level at which Paradoxididae (but not *Paradoxides* itself) appear.

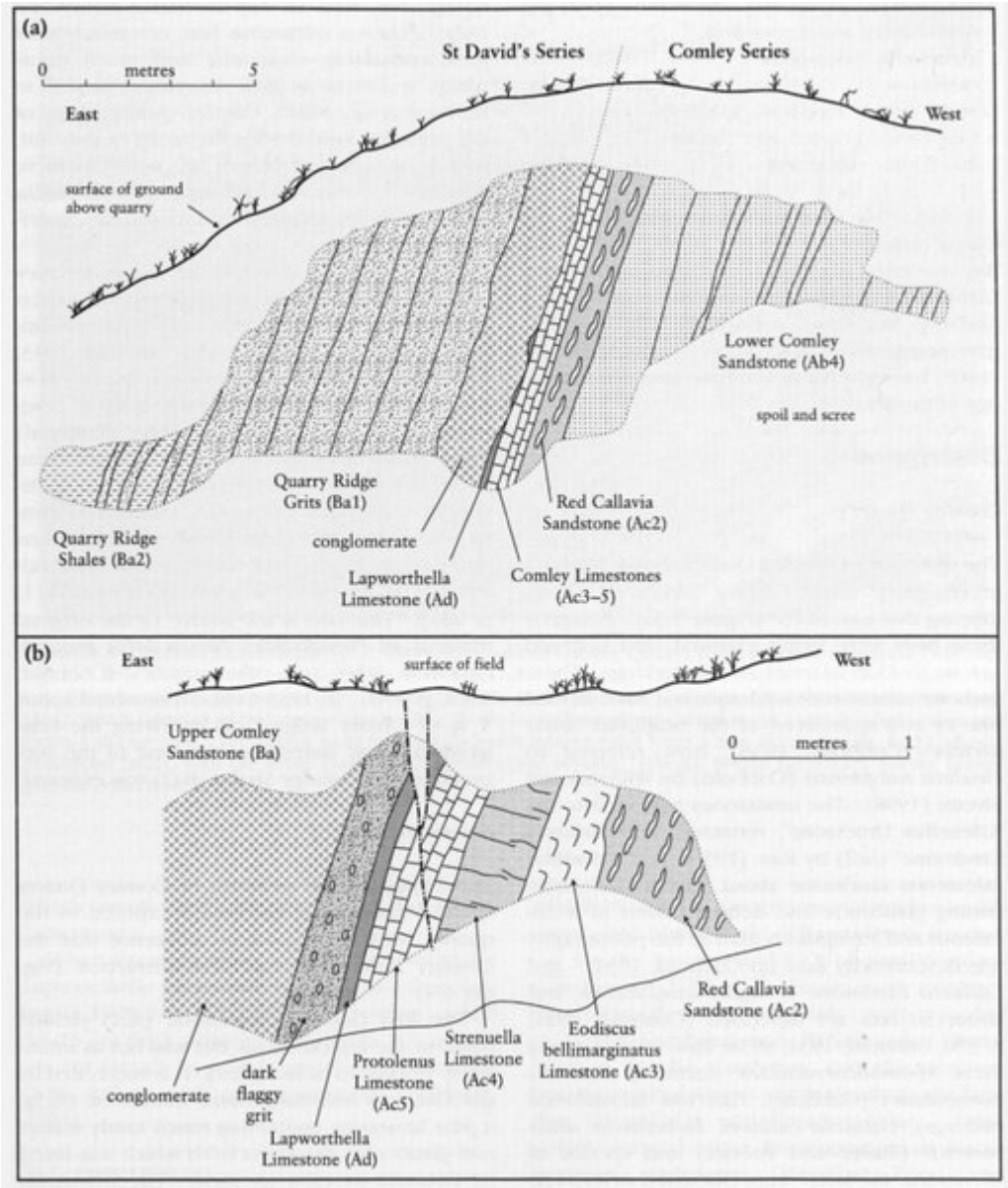
It was to avoid applying the ambiguous terms 'Lower' and 'Middle' Cambrian to British strata that Cowie *et al.* (1972) introduced the regional terms 'Comley Series' and 'St David's Series'. The former refers particularly to the faunal succession in Shropshire; the latter commences with correlatives of the *Paradoxides oelandicus* zonal group of the Scandinavian succession, following Westergård (1936).

At Comley, the Comley–St David's boundary is unambiguous. It is placed above the *Lapworthella* Limestone (Ad). The Red *Callavia* Sandstone (Ac2) and *E. bellimarginatus* Limestone (Ac3) are also unambiguously Lower Cambrian: their faunas are correlated with the *Callavia* Zone in the lower Brigus Formation of south-east Newfoundland (Cobbold, 1921, p. 370; Hutchinson, 1962), approximately equivalent to the upper Atdabanian of the Siberian sequence. Similarly, the Quarry Ridge Grits (Bal) are Middle Cambrian by any standard, a species like *Paradoxides groomi* being known from the base of the Swedish *oelandicus* beds (Westergård, 1936, p. 43). The intervening strata represent a long period, as implied by the faunal changes seen in the *Strenuella, Protolenus* and *Lapworthella* Limestones, as well as the overstepping of the former two units by the *Lapworthella* Limestone and the tectonic episode between the deposition of the *Lapworthella* Limestone and the Quarry Ridge Grits (Cobbold, 1927, p. 569). Geyer (1990) correlated the *Strenuella* Limestone with his interpretation of the Lower–Middle Cambrian boundary in Morocco, making the *Protolenus* Limestone Middle Cambrian. Hutchinson (1962) correlated the *Protolenus* Limestone with a poorly known *Protolenus* fauna at the top of the Brigus Formation and below the base of the Middle Cambrian, as he recognized it. The *Protolenus* Limestone corresponds partly with the Toyonian (latest Lower Cambrian of the Siberian succession, but regarded by Geyer as Middle Cambrian). Cobbold assigned the *Lapworthella* Limestone to the Lower Cambrian on account of its faunal and stratigraphical relationships, whilst recognizing that the fauna was not highly diagnostic.

Conclusion

Comley Quarry, interpreted with information from Excavation No. 2 nearby, is an internation ally important site. A few metres of beds represent a long period of time during which several fossiliferous limestone beds formed, with pauses in deposition — and even periods of erosion —between individual beds. Each limestone bed has an individual fauna, and the site is the type locality for a great number of species. Ultimately, after a period of uplift and erosion, a new cycle of deposition commenced, with coarse, shallow-water sands containing a Middle Cambrian fossil community.

References



(Figure 5.3) (a) Comley Quarry, looking south, showing the rock succession as drawn by Cobbold between 1906 and 1914. (b) Lower to Middle Cambrian succession seen in 1933 in Cobbold's 'Excavation No. 2', south of Comley Quarry, after Cobbold (1933). This section shows the full succession of Comley Limestones Ac3 to Ad. Note the difference in scale between (a) and (b). See also (Figure 5.4).

(Figure 5.4) Cobbold's Excavation No. 2, 200 yards south of Comley Quarry, photographed in August 1929 (see (Figure 5.3)b. The hammer rests on the Lapworthella Limestone (Ad), with the upper Comley Sandstone to the left. The Protolenus Limestone (Ac5) lies to the right of the hammer, underlain by the Strenuella Limestone (Ac4), which appears as two massive beds. The Eodiscus bellimarginatus Limestone (Ac3) is a little paler and forms a thicker bed. The rubbly beds to the right (with folding ruler lying across them) are the Red Callavia Sandstone (Ac2), with the lower Comley Sandstone (Ab4) beyond. (Photo: British Geological Survey photographic collection, A4857.)