UNDERPASS CUTTING, A350 TRUNK ROAD, SEMINGTON, WILTSHIRE

Horace Sanders

Dr. John H. Callomon and the writer examined this section (SP904609) on November 16th 2003. He has readily consented to my use of his notes, based on our findings, and on other sources, to prepare the following record. He intends offering a fully detailed report for general publication independently.

The section was extensive but much obscured by tracks of earth movers: recent heavy rains had also turned much of the softer strata to mud, impairing detailed examination.

The main interest is with the Kellaways Beds, now rarely seen except in limited temporary sections. Compared with their development between Chippenham, Cirencester and Fairford to the north, they are more fine-grained and argillaceous, also markedly less fossiliferous, the non-calcite fossils being poorly preserved, usually crushed. The general fauna, however, are now well known in detail from exposures elsewhere, so that on first examination this section would appear to offer little that is new, and in any case will soon be grassed over and unavailable.

Please refer to figures 1 and 2

Lithostratigraphy

Transition from the Oxford Clay to Kellaways Beds is almost everywhere gradational, with distinctions between Kellaways Rock, Sand and Clay being variable from place to place, even in a simple section. The Kellaways Clay was in the past divided into an upper, light coloured clay, mainly calcareous and a lower non-calcareous, slightly pyritic and bituminous band resting on the Cornbrash. This is not reached at Semington.

Bio- and Chronostratigraphy

Clearly diagnostic ammonites were found only in four horizons. Bed 8 yielded *Kosmoceras* (Jason Zone) but the shells were too weathered to permit closer differentiation. Bed 6 contained Kosmoceratids resembling *Sigaloceras enodatum*, part of the Calloviense Zone. In bed 5, in the Kellaways Rock proper were several unmistakable specimens of *Sigaloceras micans*. Extensive collecting in recent years from the Ashton Keynes gravel pits has shown that whereas *S. calloviense* was

From above:

Topsoil, alluvium etc.

LOWER OXFORD CLAY: Middle Callovian, Jason Zone

9. Clay, weathered, brown, seen ... 1 m

8. Clay, with three pyritic shell-beds, a mass of fossils; together ... 0.40 m
   Gryphaea dilobotes Duff, large, rather flat, abundant
   Kosmoceras cf. *jason* (Reinecke), crushed, broken

7. Clays, continued, structureless, somewhat calcareous, light grey, only sparsely fossiliferous ... 1.80 m

– fairly sharp facies-change

Lower Callovian, Calloviense Zone, Enodatum Subzone

6. Sands, fine-grained, silts and clays, burrowed, with a shell-bed at the top 0.50 m
   Gryphaea dilobotes, typical strongly bilobate, common
   Sigaloceras cf. *enodatum* (Nikitin), crushed

Kellaways Rock and Sands: Calloviense Subzone (Cv-XV)

5. Sandstones, fine-grained, formed by variable lenticular induration of sand, forming large dogger-like bodies of massive, hard sandstone lying mainly at the top in the softer, only weakly cemented sands, ranging in thicknesses from 0.2 – 1 m. Much of the bed is strongly burrowed but here and there remain residual structures suggesting current-bedding; elsewhere, the rock is conretionary and septarian. Fossils relatively sparse, crushed, sometimes concentrated in local accumulations, usually crushed. Many large pieces of fossil wood. ... 1.10 m
   Sigaloceras micans Buckman
   Proplanulites crassicosta (Buckman) [M], up to 0.5 m diameter, and [m] sp.
   Cadoceras aff. *sublaeve* (Sowerby) [M]
   Gryphaea dilobotes, typical but sparse, loose valves

– undulating boundary, facies change

4. Sands, fine-grained, loosely cemented in the lower part, grading up into silty clay, heavily burrowed, moderately fossiliferous (no details) ... 0.60 m

– sharp but undulating boundary

Koenigi Zone, Galilaei Subzone (Cv-13b)

3. Sandstone, fine-grained, soft, rubbly, or sands, intensely burrowed, especially in the lowest part, which is pyritic and appears as a dark band in the section-face; highly fossiliferous ... 0.80 m
   Kepplerites copernici sp. nov. [M], fairly common
   Cadoceras sp. [M]
   Gryphaea dilobotes, small (?juvenile) to medium-sized, both valves intact
   Myophorella sp.

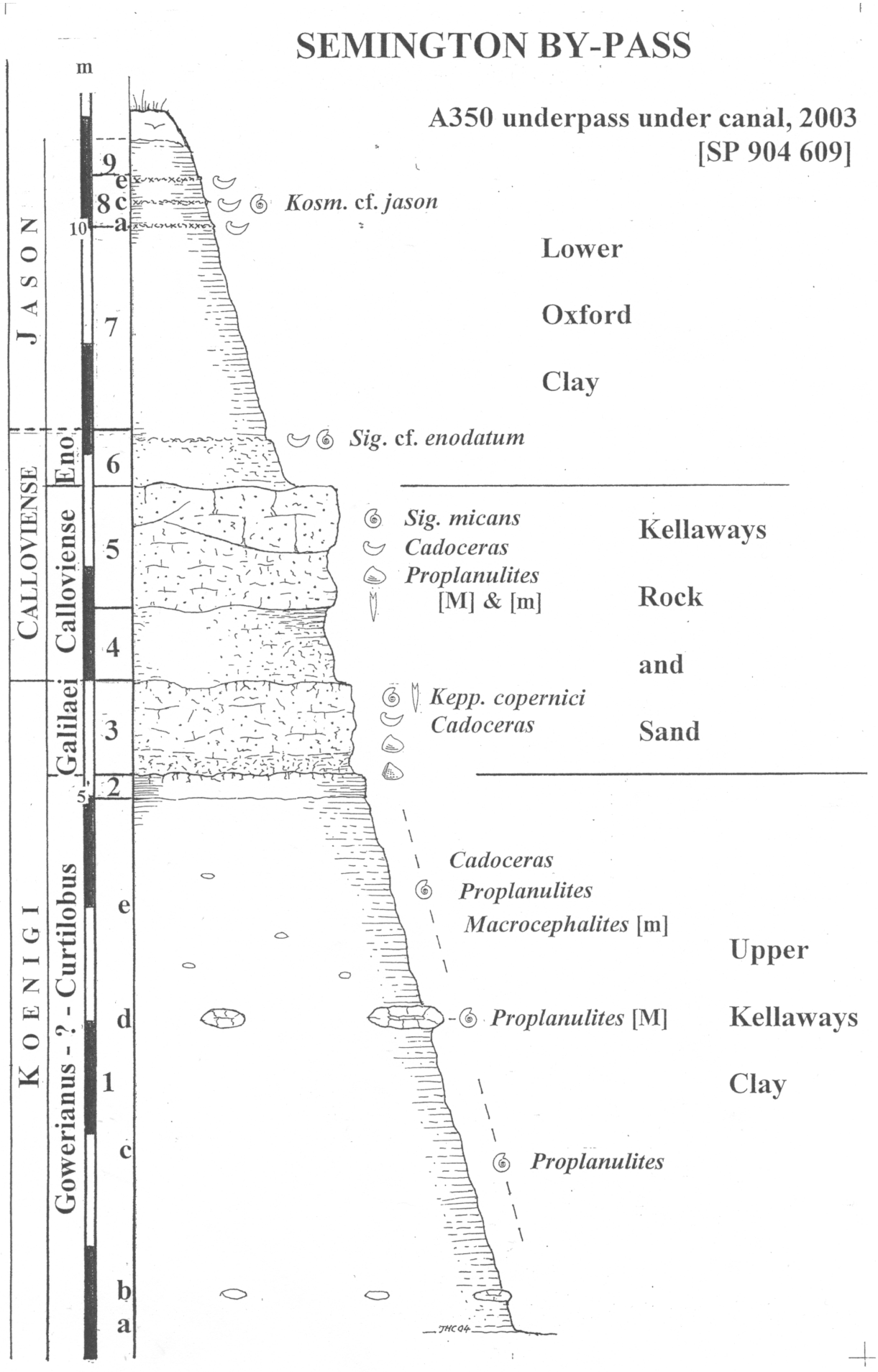
– sharp contact and facies-change, top of bed below heavily bored

Upper Kellaways Clay, ? Gowerianus – Curtilobus Subzones

2. Clay, fine-grained, tenacious, sparsely fossiliferous ... 0.25 m

1. Clays, sandy or silty, uniform, somewhat calcareous, with two layers of wells-paced flat, septarian claystone concretions: 1d, larger, 1b, smaller, and occasional small round calcareous concretions scattered randomly. Fairly fossiliferous, most of the fossils crushed and preserved as white carbonate impressions, occasional ammonites with uncrushed bodychambers, especially the concretions 1d. Seen to c. ... 4.70 m
   Proplanulites majesticus Buckman [M] (1d)
   Proplanulites sp. cf. *basileus* Buckman [M], loose bodychambers
   Cadoceras sp. [M], loose bodychambers
   Macrocephalites sp. [m], one crushed bodychamber fragment
   Nanogyra/Catinula sp.

Figure 1 Section


SEMINGTON BY-PASS
A350 underpass under canal, 2003
[SP 904 609]
m
JASON
CALLOVIENSE
KOENIGI
Eno'
Calloviense
Gallilaei
Gowerianus - ? - Curtilobus
9
e
8
c
a
10
7
6
5
4
3
2
5
e
d
1
c
b
a
Kosm. cf. jason
Sig. cf. enodatum
Sig. micans
Cadoceras
Proplanulites
[M] & [m]
Kepp. copernici
Cadoceras
Cadoceras
Proplanulites
Macrocephalites [m]
Proplanulites [M]
Proplanulites
Lower
Oxford
Clay
Kellaways
Rock
and
Sand
Upper
Kellaways
Clay
JHC04

accepted as the guide fossil to the Kellaways Rock, it is comparatively rare and occurs below *S. micans*. The faunal succession of the whole of the English Lower Callovian, proposed by Callomon, Dietl and Page, 1989, is accepted as:-

Sigaloceras enodatum
Sigaloceras micans
Sigaloceras calloviense
Kepplerites gallilaeii
Kepplerites trichophorus

It is ironic that the rarer of the two species carries the famous name, adopted worldwide in the International Jurassic Time Division ("Calloviense" being a Latinised version of "Kellaways".)

Little can be said of bed 1, the commonest ammonites being forms of *Proplanulites* which are rather long-ranging. Their predominance and the apparent absence of *Kepplerites* implies a non-sequence between beds 2 and 3, supported by a sharp change in facies from clay in bed 2 to the sands of bed 3. The *K. gallilaeii* and *K. trichophorus* horizons appear to be cut out.

Note of the Evolution of *Gryphea*

Closely similar forms of *Gryphea* occur at many levels of the Jurassic between the Sinemurian Blue Lias and the Oxfordian Corallian. They evolved in what appear in Europe to have been three successive independently derived lineages; the first in the Lower Lias, the second in the Inferior Oolite, followed by a gap in the Great Oolite, with a third in the Kellaways Beds and ranging into the Corallian. The questions are, how did each lineage originate, what were their ancestors and were the step-like origins local evolutionary changes or from centres elsewhere? The approach to these problems calls for a high resolution time control from biostratigraphy, lacking hitherto as most studies have been on museum specimens. New sections, as at Semington in the Kellaways could provide the time control for regional correlation, namely that of ammonite faunal horizons.

At Semington there is abundance of *Gryphea* in bed 3 but absence in bed 1, though it does contain other small thin-shelled oysters - *Catinula* or *Nanogyra*. Both at Ashton Keynes and at Semington, these earliest *Gryphea* are predominantly small forms, larger than *Catinula,* thicker shelled, more incurved and already bilobate. They make excellent sharp markers for mapping and correlation and could provide more insight to the origins of the Callovian *Gryphea*.

Others with geological interest were collecting from the exposures, some looking for the attractive pyritised ammonites, and well developed gypsum crystals. The formation of the latter is probably due to oxidation of the pyrites, with the formation of sulphuric acid which then reacts with the carbonate of the shell debris etc to form calcium sulphate. This crystallises out of solution to produce the hydrated form - $CaSO_4.2H_2O$.

Underpass Excavation, A350, Semington (SP904609) November 16th 2004

References:

Arkell W.J. 1933 The Jurassic System of Great Britain

Callomon J.H. 1995 Time from Fossils: S.S.Buckman and Jurassic high resolution geochronology. In LeBas. M.J. (ed) Milestones on Geology, Geological Society, London, Memoir 16, 127-150.

Callomon J.H., Dietl G and Page K.N. 1989 On ammonite faunal horizons and standard zonation of the Lower Callovian in Europe. 2nd International Symposium on Jurassic Stratigraphy 1·359-376, Lisbon Universidade Nova de Lisboa

Duff K.L. 1978 Bivalvia from the English Lower Oxford Clay. Palaeontological Society Monograph 137p 13pls, London

Hallam A and Gould S.J. 1975 Evolution of British and American Middle and Upper Jurassic Gryphea, Proceedings of the Royal Society, London 3 189. 511-542

Page K.N. 1998 A stratigraphical revision of the English Lower Callovian. Proceedings of the Geologists' Association, 100, 363-382.