Kenn Church

C.O. Hunt

Highlights

Kenn Church is an excellent representative of the later transgressive marine deposits in the Kenn area. It contains fossiliferous sands overlying glaciofluvial gravels, and shows a transition from brackish to fully marine conditions with the transgression reaching 14–21 m OD. It is proposed as the type-site of the Kenn Church Member.

(Table 10.2) Fossil molluscs from the interglacial deposit at Yew Tree Farm (after Gilbertson and Hawkins, 1978a)

Species	**Number**
Valvata cristata Müller	12
Valvata piscinalis (Müller)	3324
Beigrandia marginata (Michaud)	970
Bithynia tentaculata (Linné) shells	1039
Bithynia tentaculata (Linné) opercula	1755
Carychium minimum Müller	2
Lymnaea truncatula (Müller)	192
Lymnaea palustris (Müller)	1
Lymnaea peregra (Müller)	886
Planorbis planorbis (Linné)	25
Anisus vorticulus Troschel	147
Anisus leucostoma Müller	141
Gyraulus laevis Alder	1613
Armiger crista (Linné)	615
Planorbis spp.	3
Hippentis complanata (Linné)	21
Acroloxus lacustris (Linné)	8
Oxyloma cf. *pfeifferi* Rossmässler	6
Cochlicopa lubrica (Müller)	2
Pupilla muscorum (Linné)	2
Vallonia costata (Müller)	4
Vallonia puicbella (Müller)	6
Vallonia spp.	1
Cepaea nemoralis (Linné)	1
Tricbia bispida (Linné)	3
Punctum pygmaeum Draparnaud	1
Zonitoides nitidus (Müller)	4
Agrolimax cf. *agrestis* (Linné)	6
Agrolimax spp.	42
Spbaerium corneum (Linné)	1
Corbicula fluminalis (Müller)	72
Pisidium amnicum (Müller)	44
Pisidium casertanum (Poli)	*7*
Pisidium obtusale (Lamarck)	10
Pisidium milium Held	56
Pisidium subtruncatum Malm	138
Pisidium benslowanum (Sheppard)	24
Pisidium nitidum Jenyns	270

Pisidium pulchellum Jenyns	2
Pisidium moitessierianum Paladilhe	3
Pisidium spp.	190
Total	11 649

Introduction

At Kenn Church, interglacial estuarine deposits occupy a channel incised into the glacigenic Kenn gravels. The sequence is overlain by aeolian coversands.

Pleistocene gravels have been known in the Kenn area since the work of Ussher (in Woodward, 1876), who described gravels at Kenn and Kennpier and sandy soil over gravels at Yatton. They also noted that ' … small pebbles and large subangular and angular pieces of Carboniferous Limestone, and a few of sandstone, occur in greyish-brown soil … ' near Kenn (Woodward, 1876; p. 154). Greenly (1921) described poorly sorted sediments from Yatton and wrote ' … the formation recalls true boulder clays, but the extreme rarity of striated stones, the feebleness of the striations, and the almost total absence of erratics, forbid us to regard it as such.' (Greenly, 1921; p. 147).

Five feet of sand and gravel with pockets of coarse quartz sand containing *M. balthica* were reported from a degraded pit at St John's Church, Kenn (Welch, 1955). Welch described further gravels with *Macoma* elsewhere in the neighbourhood of Kenn. The gravel lithologies included flint, Greensand chert, quartz and Jurassic rocks. These deposits were equated with the Burtle Beds of King's Sedgemoor, a conclusion endorsed by ApSimon and Donovan (1956) and Kidson (1970). These latter authors also correlated the Kenn gravels with the marine deposits at Weston-in-Gordano and favoured an Ipswichian age for the marine incursion. Tills with striated boulders and coarse gravels overlain by marine and freshwater sands and gravels were briefly described by Hawkins and Kellaway (1971).

Gilbertson (1974) and Gilbertson and Hawkins (1978a) described the stratigraphy of the deposits at Kenn Church in a detailed survey of Pleistocene deposits in the Kenn area. These authors described coversands overlying interglacial deposits which in turn rested on coarse, unfossiliferous cold-stage gravels. Molluscan studies showed an initial brackish-water environment, with marine influence becoming stronger upwards. Amino-acid ratios were determined from a variety of fossil molluscs from the interglacial deposit at Kenn Church by Andrews *et al.* (1984). Most ratios were around 0.2, and were interpreted by these authors as indicating an Ipswichian age. The site was recently proposed as the type-locality of the Kenn Church Member by Campbell *et al.* (in prep.), who suggested assignment of the unit to Oxygen Isotope Stage 7.

Description

The following description is taken from Gilbertson (1974) and Gilbertson and Hawkins (1978a) and the fossil mollusc fauna is listed in Table 10.3. The Pleistocene deposits at Kenn form a low 'island' amidst the Holocene alluvium of the Avon Levels, rising to around 8.2 m OD (Gilbertson, 1974). They overlie Triassic mudrocks of the Mercia Mudstone Formation and are in places over 6 m thick. At Kenn Church [ST 4159 6890], a channel containing interglacial estuarine deposits is incised into the Kenn gravels. The channel appears to follow a slight rise to the south of the village to [ST 412 686] where shelly gravel with abundant *M. balthica* was found in 1969 (Gilbertson, 1974). The sequence can be summarized as follows (maximum bed thicknesses in parentheses).

9. Tarmac — made ground. (0.15 m)

8. Pale grey-brown cobbly sand — made ground. (0.38 m)

7. Pale red sand with cobbles — Brean Member. (0.21 m)

6. Dark grey sand — Kenn Church Member. (0.01 m)

5. Reddish-brown shelly sands with occasional well-rounded pebbles — Kenn Church Member. This bed contains a 'raft' of pebbly reddish clayey silt. (0.62 m)

4. Yellow shelly sand — Kenn Church Member. (0.69 m)

3. Yellow fine shelly sand, coarsening upwards — Kenn Church Member. (0.45 m)

2. Pale brown shelly sand — Kenn Church Member. (0.08 m)

1. Coarse, poorly sorted cobbly gravels, base unseen — Nightingale Member. (> 0.15 m)

Amino-acid racemization assays were carried out on a variety of shells from Kenn Church by Andrews *et al.* (1984). Assays on *Macoma* gave ratios of 0.197 ± 0.02? and 0.2 ±0.02?, on *Corbicula* 0.21 ± 0.03, on *Patella* 0.104 ± 0.005 and on *Littorina* 0.215 ± 0.02.

Interpretation

The stratigraphy and palaeobiology of the site were first interpreted by Gilbertson (1974) and Gilbertson and Hawkins (1978a). Andrews *et al.* (1984) have reassessed the stratigraphical significance of the site in view of their aminostratigraphic results and this is reviewed here, in the light of further research.

(Table 10.3) Molluscs from the interglacial deposit at Kenn Church (after Gilbertson, 1974; Gilbertson and Hawkins, 1978a)

Sample	**A**	**B**	**C**	**D**	**E**	**G**	**J**	**O**
Sample depth (m)	2.7	2.2	1.7	1.5	1.2	0.8		unstratified
Marine/estuarine taxa								
Patella vulgata Linné						2		
Gibbula sp.							1	
Littorina littorea (Linné)	1						2	
Littorina saxatilis (Olivi)	2						1	
Littorina littoralis (Linné)	1				1	1		
Littorina sp.	2f	f	2f	1f		f	f	f
Nucella lapillus (Linné)							1	2
Ocenebra erinacea (Linné)						1	1	
Buccinum undatum (Linné)							1	3

Nassarius reticulatus (Linné)						1	
Cerastoderma spp.	3f	8f	1f	f	f	f	if
Macoma balthica (Linné)	7f	16f	23f	2f	6f	90f	50f
Brackish-water taxa							
Hydrobia ventrosa Montagu	163	125	16	2	1		
Hydrobia ulvae (Pennant)	103	75	19	4	2	1	
Freshwater taxa							
Valvata piscinalis (Müller)	6	2					
Belgrandia marginate (Michaud)	1						
Bithynia tentaculata (Linné)	3						
Lymnaea peregra (Müller)	20	14	5				
Planorbis planorbis (Linné)	1	2					
Anisus vorticulus Troschel	2						
Gyraulus laevis (Alder)	11	15	1				
Corbicula fluminalis (Müller)					2		
Pisidium subtruncatum Malm	1						
Pisidium nitidum Jenyns	1						
Pisidium moitessierianum Paladilhe	1						
Pisidium spp.	2	2					

Terrestrial taxa				
Vallonia pulchella (Müller)	1			
Vallonia enniensis (Gredler)		1		
Trichia striolata Pfeiffer	1			
Helicella virgata (Da Costa)				1
Discus rotundatus (Müller)				1

The basal Kenn gravels (bed 1) were regarded as sandur deposits by Gilbertson (1974) and Gilbertson and Hawkins (1978a). The sands of the interglacial Kenn Church Member (beds 2–6) contain fossil mollusc assemblages which enable detailed palaeoenvironmental reconstruction (Gilbertson, 1974; Gilbertson and Hawkins, 1978a). A fully interglacial but rather continental environment, with July temperatures perhaps 2°C warmer than present, is suggested by the presence of the thermophilous *C. fluminalis, O. erinacea, B. marginata, Vallonia enniensis* (Gredler) and *A. vorticulus* (Gilbertson, 1974). The basal sands of the Kenn Church Member contain abundant brackish-water taxa, some marine and some freshwater species, probably reflecting a brackish-water environment with input from a clear freshwater stream. The freshwater taxa decrease rapidly upwards through the deposits, and *H. ulvae* becomes increasingly important at the expense of the less salt-tolerant *H. ventrosa* before both decline rapidly as marine taxa become dominant. Gilbertson (1974) computed a maximum mean sea level of 14–21 m OD for the height of the transgression.

The red cobbly sands of the Brean Member (bed 7), Overlying the interglacial deposit, are most likely the result of cold-climate sedimentation, probably having formed as niveo-aeolian coversands with an admixture of cobbles introduced by cryoturbation and solifluction (Gilbertson, 1974; Gilbertson and Hawkins, 1978a).

The aminostratigraphic data, with most ratios of *c.* 0.2, suggest comparison with Oxygen Isotope Stage 7 or older. The initial correlation of these sites with the Ipswichian interglacial is unlikely, as Ipswichian sites are characterized by ratios of about 0.1. (Bowen *et al.,* 1989; Campbell *et al.,* in prep.). Comparison with the Group 4 ratios of Mottershead *et al.* (1987) suggests an age of around 200 ka BP for deposits characterized by amino-acid ratios of *c.* 0.2. The presence of *Corbicula* also points to a pre-Stage 5 age, since Keen (1990) and Bridgland (1994) have argued that this species is not present in Britain after Stage 7.

Conclusion

Kenn Church GCR site is important as a representative of the later interglacial marine transgressive deposits in the Kenn area. Detailed studies of its molluscan fauna have showed the progression of a marine transgression to 14–21 m OD in a warm continental climate, probably around 200 ka BP. The Kenn Church interglacial deposits occupy a channel incised into glaciofluvial gravels and are overlain by niveo-aeolian coversands.

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Vallonia pulchella (Müller)	6
Vallonia spp.	1
Cepaea nemoralis (Linné)	1
Trichia hispida (Linné)	3
Punctum pygmaeum Draparnaud	1
Zonitoides nitidus (Müller)	4
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Buccinum undatum (Linné)							1	3
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