The River Siger: a polygenetic Holocene palaeotidal meander and creek system in the Somerset Levels

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A large palaeochannel known as the 'Siger' or 'Edithmead' meander is clearly visible on topographic maps and from field boundaries adjacent to the southern slopes of Brent Knoll in the Somerset Levels. Airborne laser altimetry (LiDAR) highlights the full extent of this large meander-arc and reveals a network of palaeotidal tributaries feeding into it. Coring within the channel has proved over 15 m of silty-clay, parts of which have been analysed using core-scanning XRF and palynology. Dating the core has proved difficult; however, one radiocarbon date is available from a thin palaeosol. This paper presents the results and discusses the formation of what is identified as a large palaeotidal meander and creek system which appears to have been initiated during the Early Holocene estuarine inundation of the Brue Valley and then re-activated as a tidal creek-system as part of the clay-lands of the Western Somerset Levels during the Late Holocene. It is argued that this history explains the composite form of a large-amplitude meander (implying a large discharge) with a typical salt-marsh creek system. The landform is thus polygenetic and this reflects the bipartite history of relative sea level along with the locally-high tidal range within the Severn Estuary. This study has implications for the Holocene history of the Somerset Levels, the Bristol Channel and also managed shoreline retreat.

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Introduction, aims and objectives

The Somerset Levels, like other low-lying coastal basins, has a history of repeated marine transgressive and regressive phases linked to eustatic, isostatic and tectonic drivers. The relative sea level history of the Bristol Channel and the inherited topography of the Parrett, Brue and Axe river valleys has produced a 10-15 m deep belt of transgressive estuarine silts and clays interleaving inland with regressive high intertidal-terrestrial peats (Allen, 2000). Whilst the occurrence of such transgressive sequences dating to the Late Holocene is known from many coastal wetlands systems, including the East Anglian Fens, the Solway Firth and most notably the Dutch Delta (Allen 2005), the geomorphology of the facies is less well understood. This is particularly true of the Somerset Levels as whilst the overall Quaternary history of the basin(s) is well known (Kidson *et al.* 1974; Murray and Hawkins, 1976; Kidson and Heyworth, 1978; Heyworth and Kidson, 1982; Campbell *et al.*, 1998), the processes of transgressive and regressive marine inundation are not fully understood and as a result palaeogeography has to be generalised. This is particularly true of the Early Holocene (lower clay) and the Late Holocene inundations of the Somerset Levels broadly resulting from relative sea level rise coupled with secondary mechanisms including changes in storminess, tidal amplitude and sediment compaction. Geological and soil mapping has shown that the Somerset Levels can be divided into two areas. Along the coast are the silty-clay dominated 'Levels' with a superimposed coastal sand-dune system, with bedrock islands such as Brent Knoll and Pawlett. Inland are the 'moors', mainly composed of later Holocene peat overlying Early Holocene lower estuarine clay, recognised by Godwin in the 1940s (Godwin, 1941, 1943, 1981). The beginning of the main peat formation has been very well dated in many places between *c.* 4,500-4,000 cal. BC. Within the moors are bedrock islands (outliers) and so-called 'burtle' islands composed of outliers of Burtle Formation sands which are known to be of Ipswichian (MIS 5e) age although some have argued for a pre-Ipswichian lower Member at Greylake (Hawkins and Kellaway, 1973; Kidson *et al.*, 1978; Andrews *et al.*, 1984; Campbell *et al.*, 1998).

Studies in the western area have shown the coastal clay to be up to 30 m thick and feather-out over peats inland (Druce, 1998). Sedimentological and palaeoecological studies of the foramnifera have shown it to have been marine in origin (Druce, 1998; Long *et al.*, 2001). Dates for this unit have only been obtainable from the thin interleaved peat bands within it. These exist between -21.3 m O.D. and *c.* -2 m O.D. (Long *et al.*, 2001), but only the upper deposits have been dated through work at Minehead (Jones *et al.*, 2005), Burnham-on-Sea (Druce, 1998) and Porlock (Jennings *et al.*, 1998). The dates available before 1998 were used as sea level index points to constrain Mean Sea Levels (MSL, Jones *et al.*, 2005). This suggested that the Highbridge cores represent a MSL of -25 to -26 m O.D. at *c.* 7,500 cal. BC (Jones *et al.*, 2005). By *c.* 6,200 to 5,900 cal. BC, MSL had risen rapidly to between *c.* -12.5 to -14 m O.D. and by *c.* 5,000 cal. BC, MSL was *c.* -8 m O.D. (Jennings *et al.*, 1998, table 1, p.166).