Wellington Estate near Harwick or Hardwicke Lane. Strata bored through in Harwick or Hardwicke Estate, about 200 yds NE from the village, 1857. Boring at Sunny Brow N of Whin Dyke, commenced 8 June 1838. Boring to SE of Sunny Brow House 130 yds S of Whin Dyke by the water side. High Pit about 2 miles W of Branden, sunk to Seaffold Main Coal. Strata bored through in the No. 1 hole in the Dearney Estate. Boring in the Barn Field in the Highall Estate near Durham in 1840. Urpheth New Pit. Feb 1835: depths of pits at Lambeth Hatfield, Peldon No. 8, 15 pits listed. 2nd hole bored at North Sunderland about 100 yds S of 1st hole which was within the quarry at Snooks Point, 1823. Frankland Engine Pit. Sheldon Engine Pit. Leaham Seaton Winning. Shincliffe Colliery E of turnpike road, commenced 11 Sep 1837. Black Prince Colliery on Coursay Common. Frindon Grange Colliery, begun 21 May 1845 & got the 5/4 seam on 22 Apr 1846. Sanfield Colliery, 1844. From Main Coal to Busty Bank Seam at Marley Hill Colliery. Minors Blossom Pit, Hetton Colliery, finished 6 Jan 1823. 3rd hole in Fishburn Estate in Miss Chiltons Quarry, 7 Sep 1837. Resolution Pit, Rainton Colliery from 9 Jan 1816 to 2 May 1818. Adventure Pit at Rainton Colliery from 9 Jan 1816 to 6 July 1817. Main Coal to Hutton Seam at the North Rainton Colliery, 1821. Meadows West Pit from 1 June 1821 to 12 June 1824. Alexandria Pit, Rainton Colliery from 22 Oct [1823] to 4 Aug 1824, to Hutton Seam. Whitfield Pit, Pleushal[?] Colliery, 30 Oct 1830. Londonderry Pit at North Pittington Colliery from 3 Jan 1826 to 1828; there are two pits here; the Hutton Seam at the Adolphus pit is better than any where yet proved. Pittington Lansdale Pit shaft by Mr Maddison in Apr & May 1825. Mr Russell's Mining at N. Hetton Colliery from 19 Apr to 28 May 1828. George Pit, Elemore Colliery begun Mar 1825, finished in High Main coal, 2 Oct 1826; to Hutton Seam 8 Feb 1827; George & Isabella pits belong to the Hetton Coal Company. Keeper Colliery near Durham, 1828–9. S. Hetton Colliery commenced 1 May 1831 and got the Hutton Seam in June 1833. Whitwell Winning, began 2 May 1836 got the Hutton Seam 21 June 1837.

Yorkshire: Manvers Main Colliery, No. 2 Pit Upcast, commenced 12 July 1886, finished 1 Feb 1887.

Portugal: No. 1 Hole for the Portuguese Coal Company near Allhandei[?] about 20 miles from Lisbon in the province of [Estremadura] bored by Wm Coulson June 1843.

Andrew L. Morrison, BGS Archivist, is thanked for drawing the Editor's attention to this item.

REPORT

A Tertiary conundrum, a palm fossil from the Trent

The terrace gravels of the river Trent are well known for their extensive evidence of human activity ranging from Lower Palaeolithic handaxes to post-medieval fishweirs. Occasionally older pre-Quaternary is incorporated and this note discusses one such piece, the lignitized base of a palm frond derived from Tertiary deposits, presumably the Miocene Brassington Formation of south Derbyshire.

Introduction

The late Chris Salisbury (1929–2004) spent most of his leisure time and retirement recovering archaeological finds and recording sections in the gravels of the Middle Trent between Burton upon Trent and Colwick, east of Nottingham. His finds include material from the Mesolithic to the post-medieval, with Bronze Age logboats (Krawiec *et al.* 2017) and the medieval bridges at Hemington (Ripper & Cooper 2009) being particularly noteworthy. His research also fed into the interpretation of the geological sequence of the floodplain terrace of the Trent and its tributaries indicating that most of the sediments belonged to the Lateglacial and Holocene (Bridgland *et al.* 2014). Salisbury also recovered geological materials which he deemed to be of interest from several quarries, and fossil wood fragments in the gravels were collected with a view to radiocarbon dating. In November 1997, whilst examining an undifferentiated gravel section in a pit at Aston-on-Trent (SK 4329), he found a hard, slightly twisted light brown 'wood' fragment, 110 mm long and a maximum of 40 mm wide (Fig. 1). It was assumed that this was Late Quaternary and therefore useful for dating. On cleaning, however, it became apparent that the item was preserved by lignitization and likely to be significantly older. It was therefore passed to Malcolm Greenwood with a view to identification. It was shown to several palaeobotanists who were unable to provide a firm determination. Eventually photographs were sent to Jen O'Keefe, who after further consultation ventured the opinion that it belonged to the Arecaceae, the true palms.

Description

The fossil consists of the basal petiole and part of a leaf sheaf of a stem with asymmetric ogival base scars where the leaf has abcised from the main stem on its upper surface. The leaf on this surface has closely spaced, 1.5–2.5 mm, narrow channels running symmetrically around a deeper median groove, the rachis, and the underside has an irregular, if slightly linear rough surface (Fig. 1). Regular growth is shown by variation in colour of each increment between the grooves. The overall surface colour is reddish-brown (5YR 4/4), whilst in the two small chips showing the fabric of the fossil it is black (N1) and vitreous (cf. O'Keefe *et al.* 2020). The broken distal end shows an irregular conchoidal fracture. Although it is not possible to put a species name on the specimen, there can be little doubt that it belongs to the Arecaceae, the palms.

Discussion

Fossils firmly attributed to the tropical to sub-tropical monocotylodon family Arecaceae first appear in the mid-Cretaceous and are not uncommon in the Eocene London Clay; records, at least of their pollen, extend to the early Miocene but thereafter palms become restricted to localities further south (Harley 2006). In northern continental Europe, Matt Pound (pers. comm.) notes that the most recent fossil occurrence of the plants is in the Middle Miocene, ~14.5 my ago; thereafter there was a significant downturn in temperatures (Hansen *et al*. 2013), and Reichelt *et al.* (2018), in plotting the modern natural distribution of the family, indicate that a minimum cold month average temperature of ≥ 5.2 C defines the family's northern limit. Clearly, a fossil from what are probably Lateglacial or early Holocene gravels must therefore be derived, but wherefrom? Preservation suggests that the specimen has not been subject to rolling in a fluvial environment, although movement in river-ice would have offered some protection against abrasion. An obvious ultimate source is the Brassington Formation of the Dove catchment in south Derbyshire, where Miocene sediments are preserved in solution structures in the Carboniferous Limestone. The pollen evidence from these structures, however, does not include Arecaceae (McCoy *et al.* 2022), although only a few of the approximately sixty outliers (Walsh *et al*. 2018) have been sampled. South of Ashbourne, the Dove flows over Permo-Triassic rocks and there are no records of sinks or similar structures, although solution of gypsum might offer some undetected possibilities, now masked by Quaternary deposits. An alternative pathway would see the fossil incorporated in the till of one of the glaciations, most recently MIS8 (Westaway 2020), and transported south-eastwards before deposition in the Trent valley. How a well-preserved early to mid-Tertiary plant macrofossil ended up in Late Quaternary sediments, approximately 60 km away as the rivers flow, from the nearest potential outcrop, remains an enigma, as indeed does its ultimate source.

Acknowledgments

The authors are grateful for the comments of Matt Pound and the several palaeobotanists who examined the specimen; in particular, Jen O'Keefe thanks Jenn Wagner of UC, Berkeley, California, for confirming her initial identification. Without the perspicacity of the late Chris Salisbury in years of examining sections in the Trent gravels, this item would never have come to light.

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***Figure 1**: Lignitized proximal end of a palm frond (Aracaceae) from Late Quaternary gravels of the Trent, Aston-on-Trent, 1997 (Photo: Paul C Buckland). The specimen has been deposited with the Derby Museum Service.*

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