SCARBOROUGH ARCHAEOLOGICAL AND HISTORICAL SOCIETY

THE INVESTIGATION OF THE REMAINS OF A COPROLITE MINE AT MIDDLE CLIFF, SPEETON

BY
CHRISTOPHER HALL
With additional material by Trevor Brigham

Scarborough Archaeological and Historical Society

Report 63 2024

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Summary
Following a cliff collapse near Speeton, south of Filey in March 2023 some timber posts were revealed which aroused public interest, the structure was identified as being the remains of a mid-19th century coprolite mine. In view of the on-going likelihood of further cliff collapse Scarborough Archaeological & Historical Society decided to carry out rescue recording of the remains, further monitoring and investigation into the history of this little-known local industry.

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National Grid Ref	TA 14842 75816
National Grid Co-ordinates	514842 475816
Site Code	MCS23

1. INTRODUCTION

On 1st March 2023 several photographs posted in the 'Photos of Filey Old and New' Facebook page by Terri-Leigh Broadhead showed a timber structure which had appeared at the base of Middle Cliff, Speeton, consisting of a row of posts, at least one of them supporting a horizontal beam. This was identified by a Scarborough Archaeological and Historical Society member as probably the remains of an adit associated with 19th century coprolite mining in this location.The identification was confirmed in the field by Peter Rawson, who has seen adit timbers expose several times over the last 60 years.

As it was thought that the unstable nature of the cliff here might result in further collapse a loss of the whole of this structure (which indeed did happen), the decision was made to rapidly record what was visible. This report sets out the background to mining activity and results of the survey.

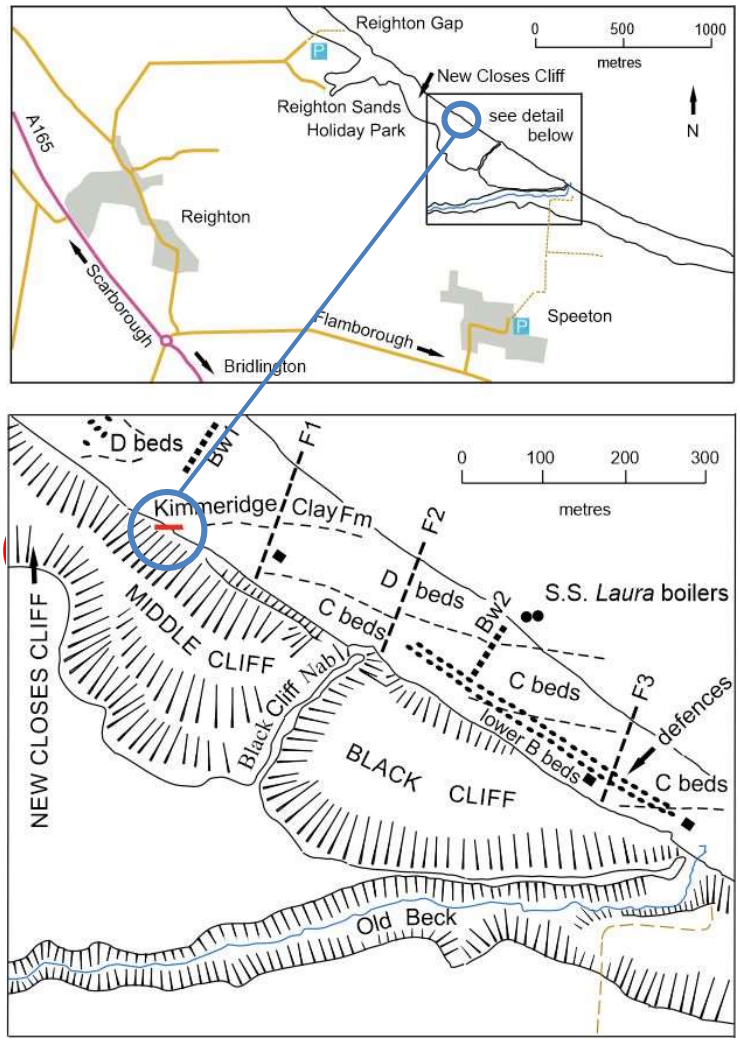

Figure 1A Location Plan and Figure 1B Site Plan
Modified from Figure 70 in Rawson and Wright (2021)

The site is towards the southern end of Filey Bay at Speeton Sands about 1km south-east of the public access to the beach at Reighton Gap and at the base of the section of cliff known as Middle Cliff (Figures 1A and 1B)). It is about 2.0km east of Reighton and 1.5km north of the village of Speeton within the latter settlement's township boundary, now within the civil parish of Reighton and Speeton.

2. GEOLOGICAL BACKGROUND

The Speeton Clay Formation, which is exposed in Middle Cliff beneath the glacial tills, largely comprises mudstones and subordinate cement-stones which were laid down as marine deposits during Early Cretaceous times[i]. The sequence of beds comprising this formation was divided by Lamplugh in 1889[ii] into 4 main units, the A, B, C and D beds (from the top downward). At the base of the D beds he described bed E, the so-called Coprolite bed, a thin (100-120 mm) layer of densely packed phosphatic nodules marking a significant time gap. The nodules include rolled and fragmentary pyritised and phosphatised bivalves, ammonites and bone reworked from the underlying Kimmeridge Clay Formation (Figure 1B).

3. HISTORICAL BACKGROUND

During the 19th century the need to feed a population both increasingly numerical and urban created an impetus for improvements in agricultural productivity including the development of artificial fertiliser or 'Chemical Manures' such as superphosphate. Coprolite beds, being rich in calcium phosphate, were a source of the raw material for this artificial fertiliser. Nationally the extraction of this material started in earnest in 1846 in the Pliocene Red Crag cliffs of Felixtowe[iii] and quickly developed especially on the Lower and Upper Greensands of Cambridgeshire, Bedfordshire, Buckinghamshire and Oxfordshire where large-scale open cast workings were developed. Production peaked at 258, 150 tons in 1876[iv] and then tailed off so that nationally this extractive industry had effectively ceased in the early years of the 20th century.

As detailed above, a coprolite bed occurs locally at Speeton and this led to the development of an outlier of this extractive industry, albeit on a much smaller scale than in the East Midlands. It is not clear when coprolite mining started at Speeton. The first Ordnance Survey map at the scale of 1:10,560 (6" to the mile) which was surveyed in 1849 by Captain Bayly RE and published on 30th December 1853 shows no features associated with mineral working, either by mining or quarrying, in this part of Filey Bay, although it does show Dulcey dock cut into the wave cut platform. This is said to have been specifically built for the coaster Dulcey used in the transport of cement-stones which were also taken from here for processing in Hull.

Figure 2
Extract from the 1:10,560 Scale Ordnance Survey Map Published 1853

The first documentary record of the working of coprolite here appears to be a letter in the York Herald of Saturday 15 January 1859 from F C Matthews junior of Driffield, entitled Coprolites on the Yorkshire Coast in which he states[v]

> 'It may not be uninteresting to your geological readers to know that there is a seam of coprolites in the cliff at Speeton, about five miles north of Flamborough Head. The seam is found at the junction of the Gault with the green sand formation, on the estate of Lord Londesborough, at Speeton. It averages five inches in thickness, is much contorted, and the coprolites are in a conglomerate mass, stratified between shale of a somewhat bituminous character……. It is now being worked by Lord Londesborough. but owing to its extreme hardness, the phosphatic nodules (which somewhat resemble those found in the crag in Suffolk), cannot well be separated from the coherent mass; consequently the seam itself is taken out and broken up. I have submitted an average piece of it to analysis, and find 100 parts to contain:-
>
> Moisture 4.76, Organic matter 6.56, Sand 13.84, Tribasic phosphate of lime 46.14, Carbonate of lime 9.09, Hydrated Sulphate of lime 11.09, Oxides of iron, alumina, and loss, 8.52, total 100.
>
> As this is an analysis of the seam itself, the nodules themselves must be exceedingly rich in phosphate of lime'

On Saturday 7th March 1863 the Bridlington Free Press reported on the uncovering of an 'immense saurian', at a depth of 150 feet from the surface of the earth at Speeton by a Mr. William Hogarth who was described as the superintendent of the coprolite mine at Speeton, the mine being worked by a Mr. Hunter, of the Sculcoates Cement Works, Hull[vi]. It is not clear whether the depth of 150 feet from the surface of the earth referred relates to the depth below the cliff top or the depth in from a mine entrance.

The most compelling documentary evidence of the Speeton coprolite working is given by Judd in *Appendix C. — On the Economic Products of the Speeton Clay* in his 1868[vii] article in the Proceedings of the Geological Society (which largely covers the working of Septaria or Cement Stones). Here he states-

> 'The "Coprolite-bed" at Speeton was first discovered on the shore, when the sand and shingle had been removed by a storm, and after-wards traced up into the cliff. It is now worked by adits in precisely the same way as the "Cement-bed;" but, as it only averages five inches in thickness, this expensive mode of working is found to be scarcely remunerative, and is likely to be soon abandoned. About 500 tons of the "Coprolites" are annually exported from Speeton Cliff. They consist of very dark-coloured, almost black stone, containing much pyrites, and mingled with worn casts of shells. Samples tolerably free from the investing clay yield from 57 to 61 per cent, of phosphates.'

The workings were still in the hands of Hunter (Edward Hunter) as Judd referenced to him as, 'the present lessee of Speeton Cliff' who provided him with details of the operation and who seems to have made a considerable sum of money exploiting the septaria, coprolites and the clay deposits for brickmaking. In view of his role in coprolite mining in Filey Bay, biographical details of Hunter are provided at Annex 1

According to Lamplugh[viii] the mines closed in 1869 following a landslip although an 1873 article in The Yorkshire Post states that 'The "Coprolite bed" furnishes phosphatic nodules

which have been found of commercial importance'[ix] - the wording of which is somewhat equivocal as to whether extraction was still taking place but Lamplugh is likely to be the more reliable source. The large scale Ordnance Survey map at the scale of 1:2500 which was surveyed in 1889 and published in 1891 shows no features associated with mineral working, either by mining or quarrying in this part of Filey Bay.

4. SURVEY AND ANALYSIS OF THE STRUCTURE

The structure exposed in March 2023 was geolocated using a Trimble GNSS satellite receiver, drawn, conventionally photographed and scanned photogrammetrically. A second structure exposed in November/December was geolocated using a Trimble Catalyst GNSS receiver and conventionally photographed

The March exposure (Figure 3) consisted of a row of four posts on a roughly east-west alignment which were numbered 1 to 4. These were positioned at centres of 65cm between 1 and 2; 41cm 2 to 3 and 48cm 3 to 4. The heights of the posts varied between 32cm (post 1) and 58cm (post 3). Each post was round with the diameters varying between 13cm and 15cm. At a later date a sixth post 150cm in diameter was briefly exposed opposite post 2 but it was not possible to measure the height of this post due to unstable cliff material above it. All these posts were interpreted as pit props.

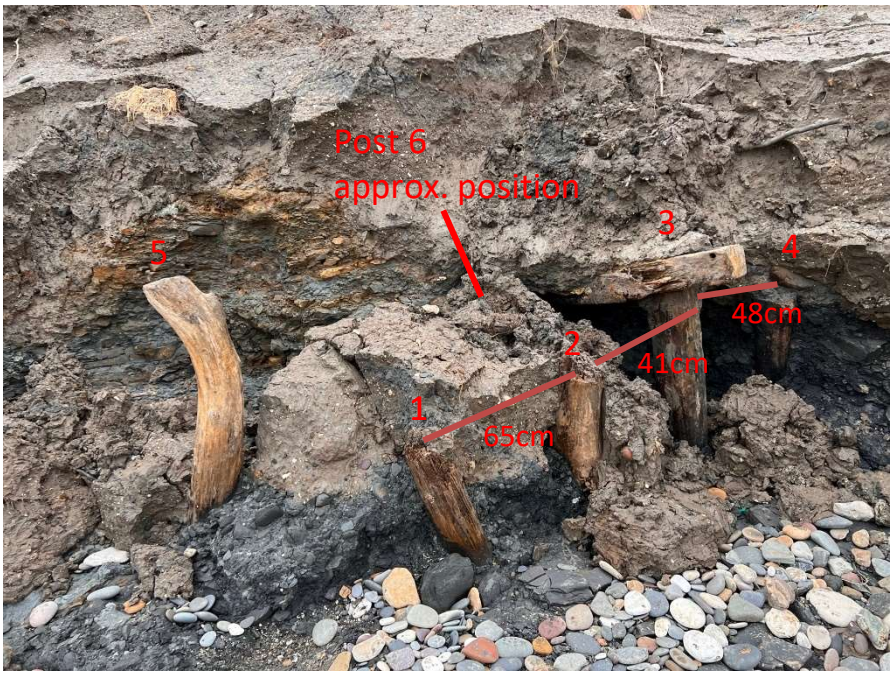

Figure 3 The posts exposed in March 2023

Post 5 (Figure 3) located to the south-east of post 1 was markedly different being 68cm high and curved towards the top. It was thought that this was unlikely to be a pit prop and may well be a relic of a tree slipping down slope following a rotational slip of the cliff. With the exception of post 5, all these posts were subsequently inundated by further cliff slippage.

Post 3 (Figure 4) differed in that it was topped by a large timber horizontal member, oblong on its end elevation but cranked in plan. This would have been the beam, spanning between the props in order to support the roof. The cranked shape, the presence of a peg hole which passed right through (Figure 5) the beam and a bolt or iron fixture

Figure 4 Post 3 showing details of the horizontal beam

Figure 5 Close detail of the horizontal beam showing the peg hole

on the inner face identified through 3D photography suggest that this beam is a re-used piece of timber. It has been suggested that this is probably from a ship. The curve and the chamfered edges and the positions of the bolts suggest it could possibly be a second or, even, a third futtock (one of the members that go to make up the individual ribs of a ship's hull)[x].

Figure 6 Detail of the rear of the beam showing the peg hole and possible iron bolt

Any hopes of recovering this timber for further analysis were dashed when a further cliff collapse obliterated, and possibly removed, these remains. However as the illustration for the Illustrated London News from the mid-19th century shows (Figure 7,) at this period there would be an ample supply of timber from wrecked ships and in addition to the beam it is possible that the pit props were re-used ships masts or spars.

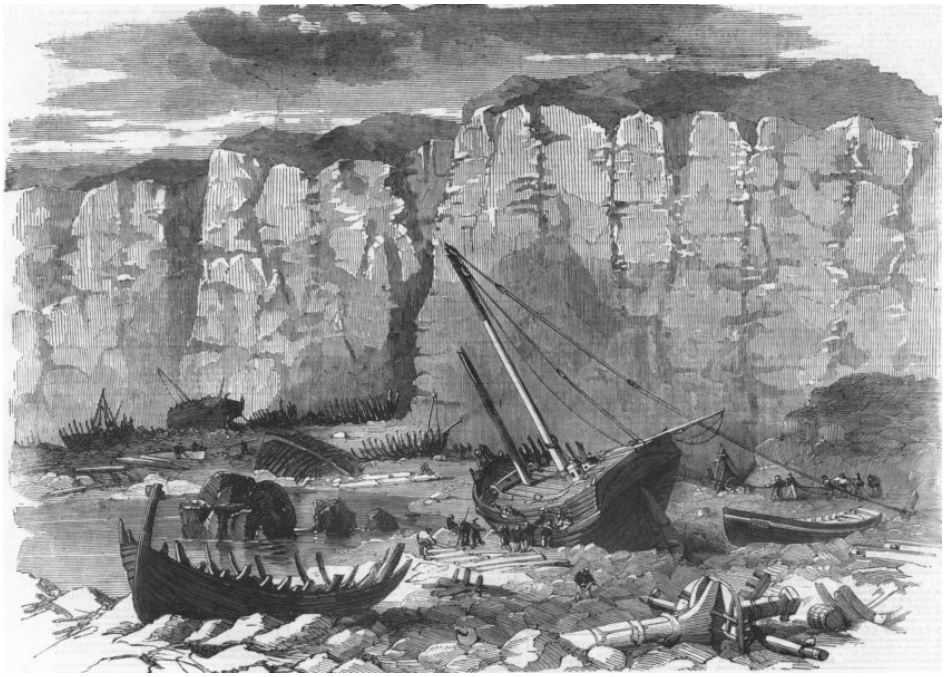

Figure 7 *Wrecks of Fishermen's Boats in Filey Bay* from The Illustrated London News, 16 June 1860

In November/December 2023 fiver further posts were exposed about 3 metres to the east of the group of posts 1 to 6 (the latter had been lost to cliff slippage by this time) and numbered 7, 8, 9 10, and 11 (Figure 8), though the last was only just visible. This set of posts was on roughly the same east-west alignment as posts 1, 2, 3, 4 and 6 and were clearly a continuation of the same adit.

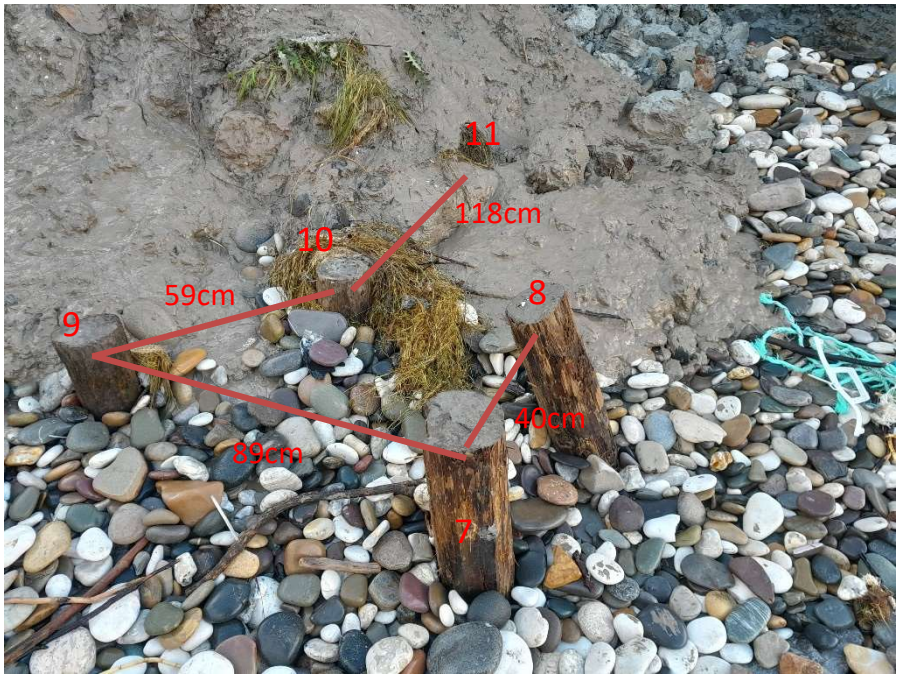

Figure 8 The posts exposed in November 2023

The posts ranged in diameter from 13cm to 16cm ie similar to that for posts 1 to 4 with a generally similar distance between them. It is likely that there is a missing post between numbers 10 and 11 which mean that there would have been four posts at 59cm centres

5. CONCLUSIONS

The two groups of posts are clearly part of the same adit running roughly east-west along the interface between the D beds and the Kimmeridge clay marked by a red line in Figure 1B. It is not clear whether there were further parallel posts north of the alignment, and now lost due to erosion and south of the alignment still buried within the cliff. Where the width of the adit could be determined ie 89cm (about 3 feet) between posts 7 and 9, the width revealed would not have given much working space. It was also not possible to determine the height of the adit.

Comparison between aerial photographs taken in 1944 with the current situation suggests that in the last 80 years the cliff has receded by about 30 metres. Extrapolating from this would suggest that since the coprolite workings were operational in the 1860s the cliff has receded by at least 60 metres. Given the instability of the cliff creating unsafe working conditions it is likely that what has been revealed recently was the very end of the adit. It was not possible to closely examine the area around post 4 but the impression was gained that this was at or close to the working face.

The area should continue to be monitored so that if further posts are revealed they can be recorded and the interpretation updated if necessary.

6. ACKNOWLEDGEMENTS

I am grateful to Trevor Brigham for much of the additional historical research and for the information in Annex 1. Professor Peter Rawson gave advice on the geology of the area and provided the maps used in figures 1A and 1B. The measured and photographic survey was carried out by the author and by Anne Clarke and Nigel Clarke. Gareth Davies carried out the 3D photography and processing. Dr Andrew 'Bone' Jones visited the site and gave us the benefit of his knowledge. Elaine Jamieson and Trevor Pearson carried out the initial GPS survey and Kevin Cowie of FFWAP the second survey.

Peter Rawson and Trevor Pearson commented on the draft of this report.

[i] Rawson Peter F and Wright John K *Geology of the Yorkshire Coast* Geologists' Association Guide No. 34 2021 p 15 and pp118-121

[ii] Lamplugh, G W *On the subdivision of the Speeton Clay* in Quarterly Journal of the Geological Society of London vol 45 1889 pp 575-618

[iii] Ford, Trevor D. and O'Connor, Bernard*. A Vanished Industry: Coprolite Mining* in Mercian Geologist vol 17 2009 p95

[iv] O'Connor, Bernard. *The Origins and Development of the British Coprolite Industry* in Mining History: The Bulletin of the Peak District Mines Historical Society, Vol 14, No.5 2002 p49

[v] Matthews, F C. *Coprolites on the Yorkshire Coast* in The York Herald Saturday 15 January 1859

[vi] Anon *Speeton* in Bridlington Free Press Saturday 7 March 1863

[vii] Judd, J. *Appendix C. — On the Economic Products of the Speeton Clay* in Proceedings of the Geological Society vol 24 1868, pp 249-50

[viii] Lamplugh 1889 op cit

[ix] Anon *The Leeds Museum* in Yorkshire Post and Leeds Intelligencer Tuesday 27 May 1873

[x] John Buglass personal communication

ANNEX 1
EDWARD AND CHRISTOPHER HUNTER BIOGRAPHICAL INFORMATION
BY TREVOR BRIGHAM

Edward Hunter (1818–90) was born in Burniston, Scalby parish, to Thomas Hunter, blacksmith (1794–1867), and Susanna (1795–1875). The family are listed in the 1841 census at East St, Scalby, but Edward had moved to Hull by 1851 where he is a 'Merchant's Head Clerk' living with his first wife, Mary at 10 Little Queen Street. Hunter clearly did well as he bought the Sculcoates Cement Company c 1860/61 from William Thomas who already made Roman cement and was trading alone after having dissolved his partnership as a brush, colour, and cement manufacturer with W Piercy in 1837. In the 1861 census Edward was a widower living at 32 Charles St with his father Thomas, retired blacksmith, and listed as a 'Cement Manufacturer'.

Sculcoates Cement Company was a small cement works on Church Street between the road and river and shown on the 1:500 OS Town Plans Edition (1880s) at TA 1024 2992. A cement works in Church St, possibly the same one, occupied by Jackson, Thorp & Co was offered for sale in 1849, and specified that included in the price was 'a Lease of 'the Stone on the Whitby Coast, well known to be the most valuable in this part of the Kingdom for the manufacturing of the Light Cement …'. (G & T Earle, on the east bank of the River Hull also made Roman cement, production there peaked in the 1870s, replaced largely by Portland cement, but they continued to make small quantities of Roman cement until 1907, with only two or three burns a year from 1898.). Hunter must at some point have added manure manufacture to his business, presumably connected with the exploitation of the coprolite beds as an extension of the cement-stone mining operation there.

Edward married his second wife Helen Heslop of Sleights in 1864 and they were living in Goole in 1871 where he is listed as 'Manager of Chemical Works', with a home address in 1881 at 'Manure Works House, Hook'. At this time Edward was 'Secretary and General Manager' of 'The Goole, Marshland, and Howdenshire Pure Tillage and Cattle Food Company, Limited'. He retired to 3 Park Terrace, Ruswarp afterwards, and died in Whitby in 1890, followed by his wife Helen in 1903.

By the 1870s Edward's younger brother Christopher Hunter (1835–1910) had moved to Hull and followed the same line of business. He married Mary Jane Gray of Scarborough in 1858 and was still living in Main St Scalby in 1861 as a 'tailor'; his mother Susanna is listed there as 'Wife of a manure agent'; as noted above, her husband Thomas Hunter was however living with his eldest son Edward in Hull at this time and was listed as a 'retired blacksmith'. Christopher had moved to 17 Pryme St, Hull in 1871 as a 'merchant and cement manufacturer', suggesting he may have taken over Edward's business on Church Street; by 1877 he was running a manure business further upriver at Stoneferry, probably on the east bank at Morley St, and Edward's original site had become the Wincolmlee Colour Works. In 1880, however, Christopher was listed as Hull, Howden and Selby agent of Edward's Goole business, but seems to have continued to operate his own business. He was living in Newland, Cottingham in 1881, where he was listed as a 'manure manufacturer'. The company offices seem to have been at 12 Wright St, from where Hunter was offering a wide range of manures in the press in 1884 under the name 'Hunter's Fish Bone Manures', which also included superphosphate, bone meal, soot, guano and other products (eg 'Driffield Times', Saturday 14 June 1884). He was a Hull agent for Rochdale Manure in 1888 based in Fountain Road, Hull; here he was a 'grocer, earthenware dealer, and wine and spirit merchant'. In the following year he was injured in a fire at his shops. By 1891 Christopher had also returned north to live at 18 St Nicholas Cliff, Scarborough, where he was still listed as a 'manure manufacturer', and had moved again to 29 Blenheim Terrace by 1901, where he is named as a 'Commission Agent Chemical Manure'.