

PART 1 - CHAPTER 3a

THE DEVELOPMENT OF THE RIVER DON AS A NAVIGATION



*SAILING KEELS (BARGES) ON RIVER DON
Commercial navigation on the Don relied on sail and horse until
many vessels became motorised in the period between the two
world wars 1918-1939*

Navigation in its most primitive forms undoubtedly took place on the River Don back into pre-history. Stone-Age Man had already devised means of crossing water long before the invention of the wheel or before he had domesticated animals. Using rafts made of tree branches or trunks lashed together or simple skin covered coracles, he was able to traverse rivers or lakes or use the craft in his efforts to catch fish.

The stage when craft began to be used for mercantile purposes is less clear, but certainly early man perfected means of water transport suitable for the transfer of goods. It is almost certain that the bluestone he used at Stonehenge, was transported by water from the hills of Pembroke via the Bristol Channel and up the rivers of Somerset and Wiltshire.

The Romans were the first people in Britain known to alter and manipulate watercourses for the purpose of navigation. They created channels between the Rivers Cam, Bedfordshire Ouse and Nene and then developed the Caer Dyke which ran for 40 miles (64.4km) to the River Witham at Lincoln. To complete the system, the Foss Dyke was then constructed to allow access to the River Trent. Having completed this work, the Romans were then able to easily transfer goods, principally grain, from East Anglia to the important provincial capital of York, or as they called it, Eboracum.

As they sailed down the Trent to reach the Yorkshire Ouse, these early navigators would have passed the confluence with the River Don. This would have provided a corridor by which they could gain access to their fort at Doncaster (Danum) which was well established by AD250.

Whether the Romans actually took advantage of this opportunity cannot be verified, but remains of a Romano-British settlement have been found at Sandtoft, on the banks of what would have been the River Idle, then a tributary of the River Don (see original map at the beginning of Chapter 2a). Evidence suggests that this site was not unique and that many other settlements existed adjacent to the lower river, all able to take advantage of the navigational facilities it provided.



*RIVER CHESWOLD
The origin of the Cheswold is unclear, it may have been a natural
secondary channel of the Don which was widened and deepened
or was possibly constructed as part of the fortification of the island
on which stood the Roman fort and later a Greyfriar's Monastery.*

By the 12th Century, mercantile navigation had become well established on the tidal Don with busy ports at Turnbridge, Stainforth and Fishlake. The most important local port of the period was Bawtry on the River Idle, which still remained a tributary of the River Don. Through this corridor much of the commercial transfer of goods to and from Doncaster, Rotherham and Sheffield took place.

With favourable tides and on flood flows, small craft had the ability to negotiate the difficult passage up the Don to Doncaster.

However, the quantity of goods they were able to transfer, coupled with the unpredictability of their timings, made their operations less profitable and despite the difficulties of road transport, merchants preferred the more secure route provided by Bawtry.

Some indication of the hazardous nature of navigation on the lower Don can be gained from the fact that Henry IV's parliament was petitioned by local merchants to remove obstructions and impediments from the bed of the river. In particular, they wished to see improvements to the bridge at Turnbridge (see illustration in Chapter 2a) near

the confluence with the River Aire, which was so hazardous that accidents were reportedly occurring daily.

Craft that managed to complete the dangerous passage up river to Doncaster would probably have moored in the River Cheswold, reputedly the shortest river in Britain. This channel, which was less than half a mile long, left the main river at a point just upstream of what is now St Mary's Bridge in Doncaster. It then looped around towards the parish church before re-entering the Don close to where the retail market now stands. These craft would by necessity have been small and unable to carry large loads. This in itself would have seriously limited their commercial viability. The beneficiaries of these difficulties were the merchants of Bawtry who had a virtual monopoly on the movements of goods to and from the middle and upper Don valley.

It is not surprising then, that the Corporations representing the towns of Doncaster, Rotherham and Sheffield turned their attention to improving the Don as a navigation. However, serious attempts to carry out improvements did not begin until the end of the 17th Century.

The main initiative for improvement seems to have come from Rotherham Council in 1697, when the House of Commons gave leave for a Bill to be brought in to make the Don navigable. The Bill was prepared by Sir Godfrey Copley of Sprotbrough, who at the time was the MP for Thirsk.

It was introduced to the House on 21 January 1698, but only 5 petitions were presented in its support. These came principally from the traders of Doncaster and Rotherham, but support was also provided by the Corporation of Leeds. Strangely, Doncaster Corporation opposed the bill on the grounds that it would destroy their Mills for which they had recently spent £1,000 on repairs.

Not unexpectedly, opposition also came from those with interests in the navigation on the River Idle, clearly feeling that the proposals posed a serious threat to their investments. With no support from Sheffield, and no official support from Doncaster, the motion to commit the bill was defeated by 92 votes to 202.

For 6 years the issue went quiet, but in 1703 Doncaster Corporation took the initiative and voted monies to be spent on a further study. On 28 November 1704 the Corporation petitioned the Commons for leave to bring in a Bill for making the Don more navigable. It stressed the need to overcome the difficulties posed by rocks, shallows and mud banks if Doncaster's role as a market for corn was to be fully realised. The Bill received its first reading on 13 December 1704, but its second reading was repeatedly postponed and in fact never took place.

In 1721, the project was again revived with strong support from the Company of Cutlers of Hallamshire. They required an improved form of transport to move the goods produced by their more than 6,000 strong workforce. At the time, they claimed to be producing goods worth over £100,000, more than half of which was going for export. Despite this claim, opposition continued to be strong, principally from milling interests and landowners. They feared that the impoundments required to navigate the fall of nearly 120 feet (36.6m) between Sheffield and Barnby Dun, downstream of Doncaster, would cause flooding of their land.

By far the most influential opponent was the Duke of Norfolk. He was concerned about the effects on his mills and forges in Sheffield. He also supplied most of the coal to industries in the Sheffield area and this was likely to be threatened if navigable access was made available to the South Yorkshire Coalfields. The Company of Cutlers tried many ways to persuade the Duke, but his claim that he should have the monopoly over all wharfs and warehouses on the canal, could not be accepted by the Company. They pointed out that bills for river navigation always gave the undertakers such rights. Disputing this, the Duke continued to oppose the Bill by inserting a number of clauses to protect his interests, rather than attempting to defeat the whole project.

The Duke was not alone in his opposition. Most of the influential landowners along the Don were against the navigation, fearing it would impair drainage of their property and cause flooding. However, when it came to committing funds towards the fight, most were niggardly and were only prepared to invest small sums, some as low as £10.

On 1 October 1722 a meeting was held at Rotherham attended by representatives of the Company of Cutlers, the Corporation of Doncaster and the landowners. It was agreed at this meeting that a survey of the river would be carried out by William Palmer & Partners. Palmer was to consider 3 alternatives for the navigation up to Doncaster:

- 1 by locks on the river;
- 2 by cutting a channel through the swamp or low grounds;
- 3 by a cut through the higher grounds.

Despite their efforts, it was all in vain, and leave to bring in the Bill was defeated on 19 February 1723.



If the landowners believed they had won a final victory, they were soon to be disappointed. By August 1723, Doncaster and Sheffield were again negotiating over the navigation. Their cause was assisted by the Duke of Norfolk's change of attitude who, whilst insisting that his interests be protected, was less concerned having learnt that the new navigation was to end at Tinsley and not the centre of Sheffield. It was finally the Company of Cutlers who took the initiative and petitioned for a Bill which would give them the necessary powers to make the river navigable from Holmstile, just below Doncaster, to Tinsley.

On 6 May 1726 the Bill passed its third reading and gave the Company of Cutlers, as undertakers of the scheme, the power to make the Don navigable for boats of up to 20 tons (20.3 tonne) and to cut, deepen and widen the river. However their powers did not entitle them to erect any new dam or weir, or heighten or lower any existing dam or weir, or to destroy any forges, ironworks or mills. Compensation to landowners was to be assessed by a named body of Commissioners.

Having achieved this victory, it followed that a further Act was necessary for improving the river below Doncaster and on 27 February 1727, Doncaster Corporation petitioned for leave to improve navigation between Holmstile and Wilsic House, near Barnby Dun. The Bill was introduced and passed without incident.

This Act differed from the first one as it allowed for damming of the river and included a structure of 4ft (1.2m) high at Long Sandall and one of 4ft (1.30m) high at Redcliffe. Works commenced on the navigation funded principally by the sale of shares and the new company held its first general meeting at Sheffield on 9 August 1733. The following month the company laid down its scale of charges for lockage and a levy of 3 shillings per ton (15p per tonne) on most goods was imposed per passage between Aldwarke and Doncaster.

Extending the navigation from Aldwarke up to Tinsley continued to pose problems which took several years to resolve. By 1740 the company claimed to have spent a total of £24,750 of capital and 2 years income of £900 on making the river navigable between Rotherham and Wilsic House.

On 23 January 1740 the company applied for a further Bill to extend the navigation further downstream from Wilsic House to Fishlake Ferry. This was finally passed and constructed at a cost estimated at £3,700. The commencement of this operation meant that work was now being carried out at both the upper and lower sections of the new navigation and by 1751 boats were at last able to navigate as far as Tinsley. This effectively meant that the construction of the Don navigation was complete. The total capital costs incurred being approximately £40,000.

On completion, the company settled into a period of quiet prosperity raising a total of £70,051 in tolls between 1759 and 1769. By far the greatest contributor to this income was the toll on coal which annually raised an average income of £3,732.

Between 1770 and 1815 several new cuts were created to improve the navigation including the one at Thrybergh and many further disputes arose with landowners over water rights.

It was in 1815 that a separate group obtained an Act for a canal from Tinsley to Sheffield. This was opened on 22 February 1819 and for the first time it became possible to sail directly from the Humber to the centre of Sheffield.

In 1802 the Stainforth & Keadby Canal was constructed as a further addition to the network. It was an independently owned waterway connected to the Dun Navigation at Stainforth and took traffic to the River Trent at Keadby. This was a far less difficult route to navigate not being influenced by the tidal effects bedevilling the lower River Don. Gradually this tidal section of the navigation fell into disuse until it was replaced entirely by the Stainforth/Keadby system.

In 1847 the Dun Navigation finally closed its books and was legally amalgamated with the South Yorkshire, Doncaster and Goole Railway. Being a competitor for its trade, the Rail Company quickly allowed the navigation to fall into neglect and concentrated its investments on its rail network.

The canals continued to deteriorate until 1888 when a new company took over control following pressure from Sheffield industrialists and the City Council. The company was named the Sheffield and South Yorkshire Navigation and brought about a new lease of life for the waterway.

In 1905 collaboration between the company and its neighbour, the Aire & Calder Navigation, resulted in the construction of the New Junction Canal which connected the South Yorkshire Navigation at Kirk Bramwith with the Aire at Southfield, near Sykehouse. Once again direct navigation between Sheffield and Goole became possible.



CONFLUENCE OF NEW JUNCTION AND STAINFORTH/KEADBY CANALS
The beginning of the New Junction & Stainforth & Keadby Navigations at Kirk Bramwith. The entrance to the New Junction Canal is on the left of the picture.

The canals were flourishing and in 1913, the company announced that for the first time more than 1 million tons (1.02 million tonne) of cargo had travelled the waterway. This prosperity continued until 1948 when the country's canal network was nationalised coming under the control of the Docks and Inland Waterways Executive. This led to further investment and improvements to several bottlenecks were carried out, most notably the lock at Kirk Sandall which was widened and lengthened.

In 1966, the British Waterways Board applied to the Government for funds to improve the network to accommodate vessels of up to 400 tons (406.4 tonne). This work was completed in approximately 1974 but the anticipated boom in traffic never materialised as many of the area's traditional heavy industries had fallen into rapid decline shortly after its completion. The Sheffield and Tinsley section was remaindered (taken out of use) in 1974 but was later to be restored.



STRAWBERRY ISLAND MARINA
One of the oxbows created by the straightening of the course of the River Don to improve navigation at Doncaster. It is now an important marina for recreational craft

Today, the South Yorkshire Canal network remains under the control of British Waterways, who regulate all commercial and recreational use of the waterways. Commercial navigation on the system is now relatively light but the reduction in freight transportation has been compensated for by a significant increase in the number of leisure craft which enjoy the improving condition of the river and canal environment.

Several marinas providing mooring and comfort facilities have been developed along the system including sites at Thorne, Stainforth and Strawberry Island, Doncaster. This latter facility using the oxbow of the old course of the Don which was created when the river was straightened to aid navigation. On the Sheffield and Tinsley section mooring facilities were later developed at Tinsley Top Locks and Sheffield Basin.



DEARNE AND DOVE NAVIGATION
Only the locks and lower pounds of the canal are left at Swinton

The construction of the Dearne & Dove Canal received Royal assent in June 1793 and connected with the Dun Navigation at Swinton. Completed in 1804, it principally aided the exploitation of coal deposits in the area around Barnsley and opened at a cost of £100,000.

Elsecar and Worsbrough Reservoirs were constructed to supply water for the navigation, the latter effectively severing the River Dove from its headwater streams.

Ironically, it was coal, the very lifeblood of the canal, which caused its demise. Severe subsidence problems resulting from the extensive underground working made maintenance a constant and costly problem. The Dearne & Dove eventually passed into the control of the Dun Navigation in 1844 and then on to Railway control in 1850. The last vessels to pass along its length were in 1934, although its lower end served the Manvers Colliery until 1952.

PART 1 - CHAPTER 3b

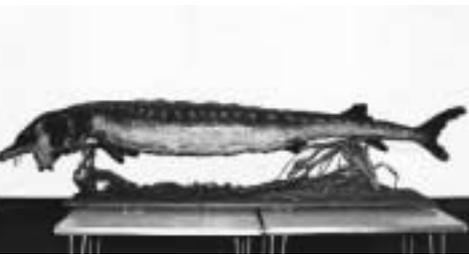
THE EFFECTS OF DEVELOPMENT OF NAVIGATION ON THE DON FISHERY

The creation of a permanently navigable channel on the River Don in 1732 had both positive and negative effects on the river's fishery. Initially under pressure from adjacent landowners, the Company of Cutlers and their agents had to concede to demands that weirs were not raised to protect drainage. However, this concession was relatively short lived and within a few years work was moving apace to raise levels, create bypass channels and to generally manipulate the river channel to facilitate boat passage.

The impact of these works on migratory sea trout and salmon would undoubtedly have been severe as weir crests were raised and a proportion of the normal flow was diverted through new channels. Ascent of larger structures, which since their original construction, had impeded migration became even more difficult and fish increasingly had to rely on a significant rise in water level to continue their upstream movement.

Trapped in the pools below the weirs, they were extremely vulnerable to predation from a range of fish-eating birds and mammals. Otters were still relatively common in the Don Valley in the 18th Century and they would undoubtedly have taken full advantage of the easy source of food provided by the trapped fish.

Human exploitation must also have increased. Trapping, netting or spearing of fish in such a vulnerable situation would have been both simple and an attractive and increasingly lucrative way of making money. Amongst the species affected by this form of exploitation was the sturgeon, which was an infrequent though regular visitor to the system. (Details of sturgeon captures can be found in Appendix VII.)



STURGEON

The above specimen on view at Doncaster museum is believed to be the fish killed with a pitch folk in 1860.

Of all the work undertaken to facilitate the navigation, the construction of tidal locks at Sandal below Doncaster in 1729 seems to have had the most significant impact and by all accounts dealt a decisive blow to the river's migratory salmonid runs.

By the middle of the 1750s the checks at Doncaster were no longer profitable and were falling into a state of decay and by 1776 all commercial interest in them was lost. To add to the problem, the value of salmon had increased in relation to the declining availability of the resource, making them a more attractive proposition to those who sought to exploit them.

According to the Historical Notices of Doncaster 1856, poaching became a major problem and it even became common practice for unscrupulous individuals to search out fish which, despite the difficulties, had reached the headwater spawning areas. Here the fish even though gravid and hardly suitable as human food were speared and gaffed in the shallow water and taken for sale.

Surprisingly, considering the problems of keeping them fresh during transportation, many of the fish were shipped to the continent, especially Paris, where they commanded a premium price on French markets.

Under such intense pressure it is not surprising that salmon numbers declined alarmingly during the last half of the 18th Century. In a publication 'The History of Doncaster and its Vicinity (1804)', it is reported that 'Barbel, pike, bream, roach, dace, eels are common but there are no salmon; trout are also very rare in the Don at Doncaster'.

This statement may be a little misleading. According to records, salmon did occasionally appear but they were probably the victims of pursuit by estuarine predators, such as seals or porpoises, both common inhabitants of the Humber at that time. These fish were probably on course for one of the Dales rivers such as the Wharfe or Ure, both good salmon fisheries in the early 19th Century, but seeking sanctuary from their pursuers found themselves swimming in the water of the Don.

This phenomena continued to occur certainly until the 1850s and then spasmodically throughout the duration of the 20th Century. However by the 1860s, levels of pollution in the Don were becoming a very significant problem. Fish entering the river would rarely have been able to ascend beyond the lower tidal limits before being killed by the effects of toxic pollutants or low dissolved oxygen.

It seems clear therefore, that in terms of a self sustaining population, the salmon had disappeared from the Don by the year 1800.

In contrast the navigation created certain benefits to the coarse fishery. The bypass channels which were constructed to allow boats to navigate around obstructions on their way up and down river, provided a means by which fish could also pass around certain impoundments. To what extent riverine species such as dace, chub and barbel were able to exploit this facility is unclear but certainly roach, bream and gudgeon, amongst others, have been found to take advantage of boats travelling through locks to move up and down navigable rivers.

In the ponded conditions of the bypass channels, marginal and submerged weeds would have been encouraged to develop along the edges of the channel as organic material normally carried in suspension by the flowing river was allowed to settle and provide the nutrients required for their growth.

Planktonic development would also have been more vigorous in these conditions providing the food source for the early development of coarse fish fry. The accumulation of body fat, essential to first winter survival, would have been more rapid as less energy expenditure was involved in maintaining station in the ponded channels, than in the flowing and often uncertain conditions of the main river.

The overall effect was probably a significant increase in the biomass of coarse fish, particularly in the lower middle reaches of the river between Rotherham and the upper tidal section. The composition of the population would also have changed with a further bias towards the more sedentary species such as roach, bream, and perch.

With the development of the Stainforth Keadby Canal in 1802 and a century later the New Junction Canal, a new impact was created on the Don.

To serve the needs of these important waterways, major engineering works were carried out on the river around Doncaster. The original channel which had been heavily impounded was further altered by the removal of a number of bends. This left oxbows where the original course had flowed. Examples of these can be still be seen at Strawberry Island and at the rear of the Dupont factory on Wheatley Hall Road. More importantly, from the point of view of its effect on the fishery, a new completely separate channel was created which took flow in excess of what was required for navigational purposes.

The Flood Channel, as it was called, is what we today regard as the natural channel of the River Don. The flows along the course of this flood channel were greatly dependent on the demands of the navigation and in periods of drought could reduce very significantly. Even in normal conditions, a considerable proportion of the Don's flow was, and still is, diverted away from this channel into the canal network eventually finding its way to the Trent at Keadby or via the New Junction to the Aire & Calder Navigation.

At the height of its commercial use in the early part of the 20th Century the lockage requirements of the canal network below Doncaster were such that, in low water conditions, a very substantial proportion of the flow was being diverted along the canal. As traffic gradually transferred to road and rail, usage reduced but even today a significant proportion of the flow of the River Don finds its way via the canal network.

Again there were both positive and negative effects to this development. On the positive side, the Don began to serve a new extensive waterway which was eventually to develop as an excellent coarse fishery with a high recreational value. On the negative side, a significant proportion of the river's flow was permanently diverted away from its natural course.

The significance of this net loss of flow on the fishery is difficult to determine. The salmon runs had already virtually disappeared by the time this network was operational and were not therefore adversely affected.

This is unlikely to have been the case with certain types of coarse fish, particularly riverine species such as dace and barbel which require clean, well oxygenated gravels in which to deposit their eggs. Reduced flows would have resulted in fewer suitable areas for reproduction with the added problems of increased silt deposition coating the gravels and starving the eggs of oxygen.

The problems of silt deposition would have been a progressively worsening one as the demands of the navigation combined with the deteriorating quality of the water passing down the river. The Industrial Revolution was, by this time, gathering momentum and the emerging industries of Sheffield and Rotherham with their urbanising effects on human populations was beginning to seriously affect water quality. These effects were to continue and by 1865 the remaining fish populations in the middle and lower Don were facing an uncertain future.

PART 1 - CHAPTER 4a

HISTORY OF WATER POLLUTION ON THE RIVER DON SYSTEM



There were few locations in Britain which offered our forefathers the opportunities for prosperity that were available in the Don Valley. The area was rich in iron and coal deposits with boundless supplies of energy available from the rivers and streams which tumbled from their sources on the high ground surrounding the valley. In addition there were vast deciduous woodlands which in the 12th Century stretched from the edges of the moors, all the way down to the wetlands bordering the tidal areas.

With reliable supplies of drinking water, wood to burn and game to exploit in the woods and streams, our early forefathers probably lived in perfect harmony with their environment.

It was the accidental discovery that a certain type of stone, when brought into contact with prolonged heat, formed into a hard durable material suitable for making tools and weapons, that sealed the fate of the Don Valley.

The stone was to be found in abundance and using the seemingly endless supplies of wood available to them, the early settlers of the valley were to become the ancestors of the Iron and Steel Barons who were eventually to turn the Don Valley into one of the largest and most important industrial centres in the world.

During their occupation of Britain, the Romans were probably the first to significantly exploit these natural resources. Smelting of iron would likely have taken place to serve the needs of their legions who were stationed at forts throughout the valleys. Remains of these sites have been found at Bradwell, Wincobank, Templeborough, Attercliffe, Kimberworth, Barnsley, Ecclesfield and Doncaster amongst others.



COLLIERY MINE WATER
Ochre (Iron Hydroxide) covers the bed of the River Don
below the Bullhouse minewater discharge

The early effects of this 'industrial' activity were insignificant, occasionally perhaps small ochreous deposits were induced by the disturbance created by digging into the earth for iron stone but such pollution was extremely localised and had little overall effect.

As demand for iron developed, it became necessary to dig deeper and deeper to reach supplies and gradually mines began to develop. Two sites are included in the records of Archbishop Grey of York 1215-1257 situated at Silkstone and Tankersley. The mine entrances were usually situated on a hillside and used the drift technique to exploit the deposits. This must inevitably have resulted in run-off from the sites finding its way down the valley side and into the stream which flowed at its foot.

These early sites were by today's standards extremely small and any effect on the receiving river or stream would have been minimal. Progressively, however, over successive centuries demand grew and slowly the effects on the surrounding watercourses became more significant. Industries reliant on the supply of iron and coal were developing and more sophisticated methods had to be employed to meet their requirements.

Good examples of the effects of this activity can still be quite vividly seen at Bullhouse on the River Don and Sheephouse Wood on the Little Don. Here the orange discolouration caused by ochre (iron hydroxide) washed in from the old workings blankets the bed of the watercourse killing plant and invertebrate life.

Despite these still relatively localised effects records suggest that water quality remained good at the turn of the 19th Century. Tremendous advances had been made by industry by this time including the development of steel manufacture. The infant coal industry was also developing with supplies required to serve the smelting processes which had turned from using charcoal to coke.

Taking advantage of the ready supplies of raw iron, and later, steel were dozens of cutlery manufacturers with mills using the water power provided by the Don and its many suitable tributaries to turn their grinding wheels.

Of even more significance was the development of the Samuel Walker & Bros, Masborough Ironworks in 1767. This site constituted the biggest iron foundry in Britain and possibly the world at that time and in 1768 employed more than 500 people.

Considering the damaging pollution which sites of this nature were destined to cause to the River Don in the future it seems remarkable that at the time they seem to have had only minimal effect.

Records of fish populations in the Don half a century later lay proof that this was the case with pollution intolerant species, such as brown trout and grayling still present. There were basic pollution laws in existence at that time exercised by bodies known as the Commission of Sewers. The enforcement powers of these Commissions, which were principally designed to improve land drainage and protect against flooding, had been granted in the reign of Henry VIII and allowed for action to be taken against people who disposed of polluting material into drains and rivers. The form of pollution which the Commissions were most concerned about was that related to human bodily functions as many of the population still relied on the rivers to supply their drinking water. More complex forms of pollution such as those likely to arise from steel manufacturing are unlikely to have been fully understood, yet despite this the rivers appear to have remained relatively undamaged.

In his account of a 'Tour of the Don' published in 1836 Laman Blanchard, is very descriptive in his observations. He refers to the Forges at Wortley as follows: 'The environment of the river at this point is repugnant in which the retirement of nature appears to have been outraged by the dull fiery, smokey atmosphere'.

Despite this damning description he goes on to describe the flora and fauna of the river with no reference whatsoever to any polluting effect on the water emanating from the earlier mentioned industry.

Only once in his book, which describes the Rother and Dearne as well as the Don, does Blanchard mention water pollution. This is in relation to the blast furnaces at Attercliffe. Coal and coke to serve the site was supplied by barges which unloaded from the Sheffield Tinsley Canal. Here he describes the water in the canal as of the deepest ochreous yellow. This was probably the result of the pumping of mine water into the canal from the nearby Nunnery Colliery owned by the Duke of Norfolk.

Clearly where the canal entered the river's natural course adjacent to what is now the Tinsley Viaduct, some pollution must have occurred as water used for the lockage of craft passed into the river. However Blanchard makes no further reference to pollution and continues on to describe the varied flora of the river downstream towards Rotherham.

By the early 19th Century, supplies of local iron ore to meet the now insatiable demand were rapidly becoming exhausted and manufacturers increasingly turned to ore from Sweden which was brought up the Dun Navigation by barge. Most convenient to this supply were sites around Rotherham which, at that time, had a considerably larger population than Sheffield. The earlier mentioned site of Walkers at Masborough was by 1836 an enormous operation. It had supplied virtually all the cannon for the British Forces during the Napoleonic Wars and had also cast, in sections, the Southwark Bridge which still spans the River Thames today. It seems almost inconceivable that these operations were not causing serious pollution of the river but according to available evidence fish populations were still abundant.

With the development of the railway system in 1840 connecting Rotherham and Sheffield with London, came a massive shift of population. Large manufacturers had at last an easy and convenient means of transporting their goods to the world and needed large numbers of workers to man their operations.

Sheffield's manufacturing base grew apace with companies such as Spear & Jackson developing new works in the Brightside area of the city, and John Brown's massive Atlas Works opened, covering an area in excess of 2 acres (10 hectares).

The population of Sheffield grew alarmingly to sustain these developments rocketing from 90,000 in 1830 to 150,000 by 1854. With no adequate means of treating or disposing of the waste created by the workers, the streets became awash with human sewage which flushed into streams and gullies and finally into the rivers.

The powers of the Commission of Sewers to control pollution were conveniently ignored as it was tacitly accepted that they could not contain the problem. Rapidly the River Don, between Sheffield and Rotherham, became little more than an open sewer and by 1860, was reported to be black and foul smelling. With the river in this condition, industrialists saw little point in restricting the release of the pollution caused by their operations and gladly accepted the opportunity to use the river as a conduit for disposing of their waste products.

From 1850 onwards, the lower reaches of the Don around Doncaster began to suffer the effects of the pollution caused upstream. The river, via its tributary the Cheswold, still supplied much of the town's drinking water yet despite this, the pollution was allowed to continue.

With the population of Sheffield still rapidly increasing and reaching 300,000 by 1881 something had to be done to alleviate the foul and unsanitary conditions.

By this time, many of the wealthier citizens had taken advantage of the new water carriage system, a primitive form of flush toilet. Installed in their homes, these facilities washed their excrement away into cesspools which were often inadequate and overflowed into adjacent streams or surface water sewers. The increased liquid content naturally accelerating the rate of transfer of their effluent and some people quickly recognised that they could avoid the smell nuisance created by cesspools altogether by directing their discharge direct to streams. For the poor, however, the use of primitive privy middens was to continue well into the 20th Century and the sound of the contents of your toilet being shovelled into a disposal cart remained a regular source of nightly disturbance.

The creation of sub-surface sewer systems towards the latter end of the 19th Century helped to relieve the nuisance in the streets, particularly in the more affluent areas. Initially these systems simply provided a means by which the effluent could more rapidly be deposited in the river but eventually it was recognised that this could not continue.

In his report of 1891, the Medical Officer of the City described the situation as follows: 'It would be hard to find in any town poorer conditions than are to be found in the centre of Sheffield. Nuisance and unsanitary conditions of every description abound. Diseases such as cholera and typhoid spread from privy middens and filthy unpaved courts into rubble sewers and contaminated water and waste flows down steep hill slopes into the river and streams.'

In 1886, the first sewage treatment facility in Sheffield was opened at Blackburn Meadows. The treatment it provided was very basic and relied mainly on a lime precipitation process which is described here in more detail.

BLACKBURN MEADOWS SEWAGE TREATMENT WORKS (1896)

SEWAGE TREATMENT IN SHEFFIELD

The first known sewage treatment facility at Blackburn Meadows was built in 1886. Prior to this time Sheffield, with a population of around 300,000, had no sewage treatment facilities. The first works operated a lime precipitation process plus aeration over weirs and finally coke filtration. They were designed to treat 10 million gallons (45460 cumecs) of effluent per day but with no provision for storm treatment. Initially the works was only operated in the daytime and only afforded 50% treatment. Despite these inadequacies the works were considered a 'model' and were visited by interested parties 'from all parts of the kingdom.'

In 1910 as a result of pressure from the 'Local Government Board' and the 'West Riding Rivers Board', the old plant was remodelled with the intention of providing extensive bacteria beds. These were finally brought into operation in 1914. It is interesting to note that during these deliberations, Sheffield Council considered several other options to remodelling the works including piping the sewage all the way to the North Sea.

In 1916 the then Manager of Sheffield's Sewage Disposal Department, Mr John Howarth, developed the Sheffield aeration system. The technique was not sanctioned for Blackburn Meadows until 1922 and brought into use in 1932. This system became the role model for all the sewage treatment works in the Sheffield Council area, and was also adopted at Chesterfield, Staveland and Swinton.

This Sheffield system, whilst providing good treatment for Biochemical Oxygen Demand (BOD) was poor at removing ammonia (NH₃). (*See glossary for definition*).

Despite its inadequacies, the plant at Blackburn Meadows does appear to have had a limited effect which increased when the works was upgraded in 1914. Records which indicate the temporary return of fish to the lower reaches of the Don from the turn of the century would seem to confirm this.

As the industrial base of the Don Valley had developed so had the demands for fuel to provide its massive energy requirement. South Yorkshire was rich in coal deposits, the seams of which outcropped along the edges of the Pennines. These easy to obtain supplies had been exploited for centuries using drift mining techniques, but this method was inadequate to meet the growing demand by the early 19th Century.

RIVER DEARNE

The River Dearne lay wholly within the coal measures and was therefore a prime target for pollution from this source. By the end of the 18th Century, a number of small deep mine collieries were in existence including



MILL ON RIVER DEARNE AT DENBY DALE
A working example of a woollen mill built on the upper Dearne

those at Smithies, Honeywell, Queens Ground and Mount Osborne. Initially contamination from these sources was either non-existent or very localised as indicated by the presence of good fish populations in the river.

In 1810 the Dearne and Dove Navigation opened which provided for the first time an easy means of transporting large quantities of coal to the steel works of Sheffield and Rotherham and down the Don for transfer to other areas of the country. With this development came a significant increase both in the number and size of collieries along the Dearne and with it a rapid increase in population.

Unlike the urbanising effects of Sheffield's steel industry, coal exploitation encouraged the development of small village communities which grew around the newly sunk shafts.

The urgency to exploit the economic boom, which was occurring, left colliery owners little time to consider the environmental impact of their operations or in many cases even the welfare of their workers. Sanitation was a secondary consideration and in many instances, the local watercourses became the most convenient form of disposal for both domestic and industrial waste.

In addition to its coal reserves, the upper Dearne Valley provided very similar conditions to the Colne and Holme Valleys, which along with the Calder Valley formed the world centre of the woollen trade, in the 19th Century.

The headwaters of the Dearne and Holme rise only a few kilometres from one another and it was therefore inevitable that this industry overspilled into the Don catchment. Mills sprang up along the upper Dearne principally centred around the villages of Denby Dale, Scissett and Clayton West. As with the collieries, the woollen mills encouraged the development of worker populations who, because of the tight confines of the upper valley, were generally housed in terraced dwellings backing onto the river. Initially with no sewage disposal systems in place, it was inevitable that domestic waste conveniently found its way to the river.

Combined with the caustic washing agents, dyes, etc and the thermal effects of the untreated discharges from the mills, the river was subjected to a lethal cocktail of pollution.

In their report of 1902, the West Riding River Board refer to improvements that they had managed to secure in the preceding 6 year period and this information helps us to understand the extent of the pollution problems which existed at that time.

In 1896 the following trade effluents were discharging to the Dearne system:

	PARTIALLY TREATED	UNTREATED
Woollen Mills	1	6
Bleaching Units	1	4
Coalwashing Plants	5	0
Other (Glassworks, Breweries, etc)	3	8

By 1902 the situation had slightly improved as follows:

Woollen Mills	4	4
Bleaching Units	4	1
Coalwashing Plants	8	–
Other (Glassworks, Breweries, etc)	8	1

In addition to these industrial discharges, there were 44 separate small sewage treatment plants serving the village and town communities all providing at best, only partial treatment. The Board's report describes the Dearne as 'much polluted by domestic sewage and by untreated or partially treated trade refuse'. These conditions were to persist for a further 80 years.

RIVER ROTHER

The condition of the River Rother was very similar to that of the Dearne at the beginning of the 20th Century. The rich coal deposits beneath the valley floor, offered huge opportunities which were being eagerly exploited by business interests. Like the Dearne, the Rother appears to have escaped the worst excesses of this development, until the 1880's although localised impacts would have been inevitable.

With the proliferation of coal mines came the same problems of localised urban development that had occurred on the Dearne. Tributaries such as the Doe Lea, River Drone and Pools Brook became repositories for the filth created by industry and its servants and their collective effects quickly reduced the Rother to a lifeless sewer.

One of the first mines to be developed in the Rother valley was Dore House Colliery adjacent to the site of Orgreave Hall. This mine commenced operation around 1820 and continued to produce coal until the turn of the 19th Century.

The sinking of Dore House shaft commenced nearly 170 years of mining and associated industrial activities in this part of the Rother Valley which were to leave a legacy of contaminated land and grossly polluted watercourses. (see Appendix V - Orgreave Reclamation Site.)

Chesterfield, the main centre of population in the valley had small industries such as glassmaking and pottery manufacture but essentially, at the turn of the century it remained a small market town. Lead mining had for centuries been practised in the hills to the east of the town, but with little apparent effect on the surrounding watercourses. The rapid development of the coal industry was soon to change all this.

INDUSTRY IN CHESTERFIELD IN THE 19TH CENTURY

In 1801 Chesterfield was a small market town with a population of 4,267.

Its main industries, though these were generally one man operations, were lead mining, iron stone mining and stone quarrying.

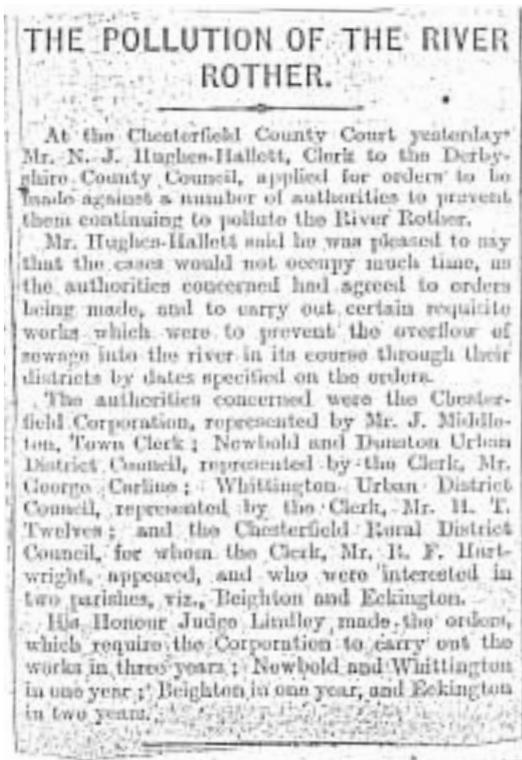
In 1840 Chesterfield was linked to the newly developed railway system and this provided opportunities for the expansion of commerce.

Lead mining which had probably existed in the area since Roman times peaked around 1850 with merchants from various areas of the country coming to the town to buy ingots of lead from miners who sold their goods at the local markets. By 1880 the trade in lead had gone into rapid decline to be replaced by a number of small manufacturing industries.

Probably the largest employer at that time was the tobacco works, but other industries important to the local economy were Carpet Weaving, Boiler Making, Cannon Casting, Lace Making and Cutlery.

Locally the Staveley Iron and Steel Works founded in the mid 18th Century was perhaps the most important development in the area. It was active and provided trade to the Chesterfield Canal when the canal opened in 1777.

A photograph contained in a publication entitled 'The Making of the Rother Valley Country Park' produced by the Country Park Joint Committee may give a clue to the condition of the Rother in 1900. It shows two ladies sitting on the banks of the river just downstream of Bedgreave Mill which today forms part of the visitor centre at Rother Valley Country Park. (See Part 1 Chapter 1a photo titled Bedgrave Mill).



SHEFFIELD TELEGRAPH, FRIDAY 28 APRIL 1905

On the surface of the river can clearly be seen what appear to be extensive growths of filamentous algae (Blanket Weed), which would indicate that the river was highly nutrient enriched. The source of the nutrients which would encourage this excessive growth of algae could almost certainly have been traced to partially or untreated sewage entering from the developing upstream mining communities.

In 1905, as a result of extreme public concern the Clerk to the Derbyshire County Council applied to the Chesterfield County Court for orders to prevent various local authorities from continuing to pollute the river. These orders were granted and the authorities concerned were given a maximum of 3 years to provide treatment facilities for the sewage created by their parishioners. Regrettably, their efforts were never able to adequately keep pace with the demands of an increasing population and as a result the Rother continued to deteriorate.

Throughout most of the 20th Century the sad story of the exploitation of the River Don and its tributaries has continued. The steel industry created thermal pollution problems which raised the ambient temperature of the river reducing dissolved oxygen concentrations, discharged acids from pickling processes and coated the river surface with oil from quenching and lubricating.

Coal mining and its associated industries produced gross solids which coated the bed of the river and streams, discharged highly toxic heavy metals, arsenic, cyanides and phenols and contaminated adjacent land with tar liquors.



FOAM ON RIVER
This was a common sight towards the end of the 1960's occurring as a result of increasing household use of detergents

In combination with this miasma of destruction was the organic pollution created by the human population of South Yorkshire. Inadequately treated sewage raised BOD and lowered dissolved oxygen levels. It created ammonia concentrations well in excess of that which could sustain fish life and produced the phosphates which encouraged algal development and destroyed natural in-stream flora.

Foam, created by the use of non-biodegradable detergents, became perhaps the most visibly obvious indicator of the

river's condition in the 1950's and 60's. Huge banks of grey brown bubbles created by the re-agitation of detergents were formed as the water tumbled over weirs. Often these banks covered the river's surface to a depth of several feet, and in windy conditions clouds of foam were lifted from the water and carried through the air for hundreds of yards.

The combination of all of these and many other forms of pollution from a range of industrial activity served to create for the River Don, the well deserved but unenviable title of one of Europe's filthiest rivers. A title which it retained well into the 1980's.

PART 1 - CHAPTER 4b

EFFECTS OF WATER POLLUTION ON THE RIVER DON FISHERY

The chemical destruction of the water environment was the final and perhaps most devastating human effect on the fish populations of the River Don. It is clear from reports indicating the presence of salmon that chemically, the Don remained in good condition until the end of the 18th Century. Salmon populations had declined markedly by this time, but this was undoubtedly attributable to the physical changes which occurred rather than to deteriorating water quality.

Reports of salmon continuing to enter the lower Don between 1800 and the late 1840's confirm that the tidal reaches at least remained chemically capable of sustaining their presence but by 1850 things were deteriorating rapidly.

Powers as mentioned earlier, to control the pollution of river and streams had been introduced in 1531 during the reign of Henry VIII by a statute called the Bill of Sewers. This allowed for the appointment of Commissioners Of Sewers who were to oversee, amongst other things, land drainage and basic pollution control.

One of the principal responsibilities of the Commission was to ensure that sewers to convey surface water were maintained and did not contaminate the rivers or streams many of which provided drinking water to the local population. Protection of aquatic life, including fish, was probably not seriously considered but, never the less, ensuring their drinking water supply also helped to protect the aquatic environment.

Gradually as the pace of the Industrial Revolution gained momentum, so the problems of water pollution began to increase. It was the drift of workpeople to towns to serve the needs of developing industries that was to create the most significant effect. Human waste began to find its way into streams and eventually to the main river damaging and destroying the fish populations which existed.

As well as affecting water quality in the main river, the destruction of these tributary streams denied certain species of fish the habitat necessary to the maintenance of their populations. Brown trout stocks would have been particularly hard hit by this deterioration as traditional spawning and nursery areas became unsuitable for use.

Their loss however, was to be of little consequence considering the damage which was occurring to the environment of the main river. Industry had continued its rapid expansion and by 1860 the population of the City of Sheffield had reached almost 200,000.

By this point in time the river throughout the city and downstream to Rotherham was being grossly polluted by human and industrial effluent and fish had been almost totally annihilated. Natural purification was, however, still allowing coarse fish populations to maintain a tenuous hold in the lower river, but the numbers and range of species present, even here, was in rapid decline.

It was the collapse of Dale Dyke Reservoir at the head of the Loxley Valley which dealt a final and decisive blow to these remaining populations. The resulting flood rapidly carried the gross pollution from Sheffield down to Doncaster leaving thousands of fish dead in its wake.

The people of the lower valley were greatly incensed at having to endure the nuisance caused by the pollution of their upstream neighbours and in 1868 the local MP for Doncaster, Mr FJS Foljambe raised the matter in Parliament.

LETTER OF COMPLAINT FROM MR F S J FOLJAMBE

F S J Foljambe Esq MP has taken the initiative toward the purification of the River Don. In a letter to the Mayor of Doncaster dated Aldwalke December 1868 he states:

I have desired of my solicitor at Rotherham to give notice to the local board of steps to abate the nuisance (draining to the river) and I cannot but think that if your corporation would take a similar step we might get something done. If we allow them to take their own time it may be years before they would move!

Letter prompted by the result of a flood on December 1868 when over half a ton of dead fish was removed from the Don at Doncaster.

He complained that the large quantities of filth and sewage from Sheffield, Rotherham and other expanding industrial towns along the Don were poisoning the river and killing the fish. He also made a plea for steps to be taken to abate the nuisance draining into the river.

His pleas clearly fell on deaf ears for no action was taken and sadly the people of Doncaster were left to witness the insidious demise of their once prolific fishery.

Fish which did survive, according to the Yorkshire Anglers Guide written by Tom Bradley in 1894, were confined to the tidal reaches below Doncaster. Bradley described the Don between Hazlehead and Doncaster as un-fishable and a solid inky mass of pollution.

Surprisingly in his article, Bradley mentioned salmon which ran into the tidal river as far as Wheatley. These fish could not have been a self sustaining population as access to suitable spawning grounds was by then, an impossibility. Their presence must, therefore, have been the result of seal or porpoise activity in the Humber Estuary, leading to the fish being diverted away from their original course to the Dales rivers of Yorkshire. How long these fish were able to survive in the Don is a matter for conjecture, but it is likely that their continued existence relied heavily on flood flows maintaining reasonable dilution. As conditions returned to normal, they would rapidly have succumbed to the effects of the pollution.

There were also areas, principally in the headwaters of the river and its tributaries, where brown trout populations managed to maintain a tenuous hold.

Gannister mining which was extensive around the Bullhouse area above Penistone was the first major source of pollution entering the Don, but above that the river remained relatively clean.

GANNISTER MINING

Gannister is a refractory siliceous sedimentary rock which occurs beneath coal seams. It is commonly used as a lining for blast furnaces and as such was important in the development of the steel industries of the Don Valley.

There were many gannister mines situated along the upper Don Valley, several of which still cause ochreous deposition as a result of uncontrolled discharges.

The most visible and probably the most damaging is on the Don at Bullhouse just above Penistone.

Here a small brown trout population managed to maintain a toe hold for the next century despite the construction of reservoirs in the headwaters. The story of this population is covered in Part 2 Chapter 1.

The history of the demise of the Don fishery is not quite complete without reference to the apparent improvement which occurred following the start of the 20th Century. Basic treatment was by this time being

applied to the effluent created by the citizens of Sheffield and this was to extend as new facilities were developed throughout the system.

The introduction of this treatment appears to have had quite a significant impact, certainly in the Doncaster area. According to Howes, 'The History and Distribution of Fish in the Doncaster District', the length between the town and Sprotbrough was of considerable amenity value between 1900 and 1940. The river was used for a range of recreational purposes including boating, swimming, fishing and regular angling competitions were held. Towards the end of the period conditions began to steadily deteriorate once more and with dwindling success the anglers and other users increasingly turned their backs on the river.

THE RIVER ROTHER

In the aforementioned publication 'A Tour of the Don' published in 1836 by the Sheffield Mercury, Laman Blanchard described the River Rother as a beautiful stream and refers to anglers enjoying catching chub, roach and perch from its waters.

The Rother had previously been one of the principal sources of salmon stocks to the Don and had remained a pristine stream throughout the early part of the 19th Century. Regrettably, it too was destined to fall victim to the ravages of industry as coal mines were sunk to take advantage of the rich deposits in the coal measures beneath its waters.

The information available suggests that the destruction of the Rother fishery occurred some 30 years or possibly more, after that of the Don. However, its effects were no less complete and by the turn of the 20th Century its waters had been reduced to little more than an open sewer.

Like the Don, several of the Rother's upper tributaries did manage to retain their fishery status. The most significant of these was the River Hipper which flows down from the Pennines to join the Rother at Chesterfield. In this small stream there were as well as brown trout, the last remnants of the Don's once prolific population of grayling.

THE RIVER DEARNE

The pattern of destruction on the Dearne was similar to that which befell the Rother. By all accounts the river managed to maintain its fish population for some years after the destruction of the stocks in the main river but this was only a temporary reprieve. Coal mines urgently required to serve the insatiable appetite of industry, were being sunk all along the valley between Clayton West and the river's confluence with the Don at Denaby.

Human populations increased accordingly to man the mines and the combined effluent from the industry and from those who served it quickly began to take its toll on fish populations.

By the turn of the 20th Century the River Dearne was effectively dead, certainly from Barnsley to its confluence with the Don.

Although a similar fate befell a number of its tributaries, including the River Dove, several streams because of their more rural location, managed to escape their populations of brown trout. Probably the most important of these was Cawthorne Dyke.

THE LAST STRAW

The onset of the Second World War, with its effect on industrial production, proved to be the final nail in the coffin of the Don's fish populations.

By 1940 the massive war effort, so ably supported by the Industries of the Don Valley, was exercising a profound effect on water quality. Apart from the populations isolated in the headwater streams, the remaining pockets of fish were quickly eliminated as the river was reduced to a complex cocktail of industrial and human pollution.

The insidious destruction of the Don's fish populations had taken the inhabitants of the valley eight centuries to achieve and was now all but complete. It had been won by the negligence, greed and apathy of successive generations, who had finally earned for the river an international reputation for gross pollution and environmental degradation.



ANGLERS ASSOCIATION OFFICIALS

Officials of Doncaster Angling Association hold their annual protest match on the River Don at Doncaster in the 1960's. They were to wait a further 25 years before fish were regularly caught at this point. Sadly the gentleman on the left of the picture, Mr Ray Garrity, did not live to enjoy the benefits of the improvements.