THE NORFOLK KEEL

Theole E B Douglas-Sherwood

Thesis submitted to the University of St Andrews
for the M.Litt. Degree

Scottish Institute of Maritime Studies
University of St Andrews

September 1987

I, Theole Elizabeth B Douglas Sherwood hereby certify that this thesis which is approximately 36,000 words in length has been written by me, that it is the record of work carried out by me and that it has not been submitted in any previous application for a higher degree.

Date 8th March 1988 Signature of candidate

I was admitted as a candidate for the degree of M.Litt on October 1984; the higher study for which this is a record was carried out in the University of St Andrews between 1984 and 1987.

Date 8th March 1988 Signature of candidate

I hereby certify that the candidate has fulfilled the conditions of the Resolution and Regulations appropriate to the degree of M.Litt of the University of St Andrews and that she is qualified to submit this thesis in application for that degree.

Date 10 March 1988. Signature of supervisor

In submitting this thesis to the University of St Andrews I understand that I am giving permission for it to be made available for use in accordance with the regulations of the University Library for the time being in force, subject to any copyright vested in the work not being affected thereby. I also understand that the title and abstract will be published, and that a copy of the work may be made and supplied to any bona fide library or research worker.

Date 8th March 1988 Signature

THE NORFOLK KEEL

The thesis examines Norfolk keels, a type of river barge, and their place in the economic development of east Norfolk and north Suffolk from the eighteenth century.

Norfolk keels are detailed through documentary sources, describing their area of origin and application; through iconographic or pictorial sources, describing their outline hull shape and rig; through contemporary documentation (including two ship models) of the last known working Norfolk keel; and through the example of a recovered Norfolk keel.

T E B Douglas-Sherwood, 1987.

Contents

Acknowledgements 2

List of illustrations 3

Introduction 8

Part I: Navigation and Trade 11

Navigation and trade in east Norfolk to 1800
The registration of vessels on inland waters
Navigation and trade in east Norfolk after 1800

Part II: A Pictorial Account of Norfolk Keels 50

Norfolk keels from the eighteenth century
Norfolk keels of the nineteenth century
The two masted barges
The passing of the keels
The traditional Norfolk keel and its variations

Part III: The Last of the Norfolk Keels 103

The Hobrough Depositor
The Bridewell Museum Norfolk keel model
The Science Museum Norfolk keel model

Part IV: The Whitlingham Keel 142

Discovery and location
Initial survey
Decision to excavate
Strategy
Overburden
Underwater excavation
Removal and lifting operation
The uncovered Whitlingham keel

Epilogue 217

Footnotes 221

Appendix I: The 1795 Norwich Register, transcript of Act 233
Appendix II: The 1795 Norwich Register 235
Appendix III: The 1795 Norwich Register: Main river routes to Great Yarmouth 247
Appendix IV: The 1827 Norwich-Lowestoft Navigation Act, Schedule of harbour and river rates on cargoes 250

Bibliography 252

Acknowledgements

With grateful thanks for their kind assistance to:

Mr Thomas Conlin, Engineer, and Chairman to the Norfolk Keel Trust - for his work in the excavation and recovery of the Whitlingham Norfolk keel.

Mr Jack Wickins, Design Engineer - for his time and interest in the design and construction of the Norfolk keel cradle.

Mr James Petts, Naval Architect - for his time and interest in assisting in the recording of the Science Museum Norfolk keel Model and the Whitlingham Norfolk keel.

Mr David Jones, Curator, The Bridewell Museum - for his assistance in the location of records.

Mr J Roome, Curator, The Science Museum - for his assistance in the recording of the Science Museum Norfolk keel Model.

Mr Gerard Douglas-Sherwood, Keel Trust volunteer - for his assistance in recording the Whitlingham keel.

List of Illustrations

1. The Whitlingham Norfolk keel in conservation environment. 12

2. East Norfolk - principal navigation. 13

3. The thirteenth century bailiff's seal, and the fifteenth century town seal, of Great Yarmouth. Presently held at the Norfolk Record Office. 15

4. The Hardley Cross - marking the boundary between the navigation control of Norwich and Great Yarmouth - T Conlin. 20

5. The Hardley Cross - enlarged detail of inscription - T Conlin. 21

6. Distribution of keels and wherries according to the 1795 Register of Vessels on Inland Waterways. 29

7. Enlarged detail of a Norfolk keel from the 1741 South West Prospect of Great Yarmouth by J Corbridge. 53

8. Enlarged detail of a Norfolk keel from the 1741 South West Prospect of Great Yarmouth by J Corbridge. 55

9. Enlarged detail of a two masted vessel from the 1741 South West Prospect of Great Yarmouth by J Corbridge. 56

10. Enlarged detail of the Norwich city quay from the 1741 South East Prospect of the City of Norwich by S & N Buck. 58

11. Enlarged detail of the cathedral water access from the 1741 South East Prospect of the City of Norwich by S & N Buck. 61

12. Enlarged detail of a Norfolk keel from the 1741 South East Prospect of the City of Norwich by S & N Buck. 63

13. Enlarged detail of a rowed passenger boat from the 1741 South East Prospect of the City of Norwich by S & N Buck. 64

14. Enlarged detail of Norfolk keels passing under the Bishop's Bridge from the 1741 South East Prospect of the City of Norwich by S & N Buck. 65

15. Enlarged detail of a Norfolk keel, stern view, from the 1741 South East Prospect of the City of Norwich by S & N Buck. 67

16. Enlarged detail of moored Norfolk keels from the 1742 West Prospect of the town of Great Yarmouth by J Corbridge. 69

17. Enlarged detail of a Norfolk keel, stern view, from the 1742 West Prospect of the town of Great Yarmouth by J Corbridge. 70

18. Enlarged detail of a rowed passenger boat from the 1742 West Prospect of the town of Great Yarmouth by J Corbridge. 72

19. Enlarged detail of a moored Norfolk keel from the 1742 West Prospect of the town of Great Yarmouth by J Corbridge. 73

20. A Norfolk keel from the 1790 A North West View of the Quay of Great Yarmouth by J Butcher. 75

21. A Norfolk wherry from the 1790 A North West View of the Quay of Great Yarmouth by J Butcher. 76

22. Boats on Breydon (1825) by J Stannard. 84

23. View on the Yare Near Thorpe Church from Scenery of the Rivers of Norfolk by J Stark. 88

24. Harrison's Wharf, King Street, from Scenery of the Rivers of Norfolk by J Stark. 89

25. Carrow Bridge from Scenery of the Rivers of Norfolk by J Stark. 91

26. Oil painting of a Norfolk keel, possibly by an artist of the Norwich School, of the 1820s. Private collection. 92

27. Enlarged detail of advertisement for Hobrough's Patent Depositor (1894). 105

28. Advertisement for Hobrough's Patent Depositor (1894). 106

29. Cubitt's Marsh (5th July 1895) by JS Hobrough. 108

30. Strumpshaw - Train Reach (14th March 1896) by J S Hobrough. 109

31. Strumpshaw - Train Reach (14th March 1896) by J S Hobrough. 110

32. Untitled photograph by J S Hobrough. 112

33. Ordnance Survey (TG 287 077), Whitlingham Marsh of 1907 and 1914. 113

34. Lines drawing of the Bridewell Museum Norfolk keel. 115

35. Lines drawing of the Bridewell Museum Norfolk keel model. 116

36. Lines drawing of the Bridewell Museum Norfolk keel model. 117

37. The Bridewell Museum Norfolk keel model. 119

38. The Bridewell Museum Norfolk keel model, stern view. 120

39. The Bridewell Museum Norfolk keel model, rudder. 121

40. The Bridewell Museum Norfolk keel model, overview, aft deck and hold. 122

41. The Bridewell Museum Norfolk keel model, overview of forward deck and hold. 123

42. The Bridewell Museum Norfolk keel model, forward side view. 124

43. The Bridewell Museum Norfolk keel model, bow. 126

44. The Bridewell Museum Norfolk keel model, tabernacle. 127

45. The Bridewell Museum Norfolk keel model, masthead. 128

46. Lines drawings of the Science Museum Norfolk keel model - J Petts. 130

47. Lines drawings of the Science Museum Norfolk keel model - J Petts. 131

48. Science Museum Norfolk keel model - J Petts. 132

49. Science Museum Norfolk keel model, aft - J Petts. 133

50. Science Museum Norfolk keel model, forward - J Petts. 135

51. Science Museum Norfolk keel model, tabernacle - J Petts. 136

52. Science Museum Norfolk keel model, mast and sail - J Petts. 137

53. Ordnance Survey (TG 287 077), Whitlingham Marsh 1984. 143

54. Overburden clearance by mechanical excavator. 151

55. The Whitlingham keel Site - section sketch (not to scale). 152

56. The Whitlingham keel Site - sketch plan (not to scale). 153

57. Use of water dredge and manual overburden clearance. 155

58. Air lift. 156

59. Grid Scaffolding over the Whitlingham keel Site. 158

60. Grid Scaffolding over the Whitlingham keel Site. 159

61. The Whitlingham Norfolk keel underwater, bow area - R A F Marham. 161

62. The Whitlingham Norfolk keel underwater, port gunwhale forward - R A F Marham. 162

63. Steel overhead bridge on keel at Whitlingham. 164

64. Steel overhead bridge with buoyancy at Corporation Quay. 166

65. The Lifting Cradle design - Jack Wickins. 168

66. The Whitlingham keel in support cradle following removal of buoyancy. 169

67. The Whitlingham keel in process of lift in cradle. 170

68. The Whitlingham keel in process of lift in cradle. 171

69. The Whitlingham keel on low loader for transportation. 172

70. Lines drawings of the Whitlingham Norfolk keel - J Petts. 173

71. Lines drawings of the Whitlingham Norfolk keel - J Petts. 174

72. Sample nails and bolts removed during excavation. 176

73. Bow section of the Whitlingham keel. 177

74. The Whitlingham keel, side view, bow. 178

75. Barge remains at Lake Lothing, Lowestoft. 179

76. Barge remains at Lake Lothing, Lowestoft. 180

77. Stern section of the Whitlingham keel - T & G Douglas-Sherwood 181

78. Stern section of the Whitlingham keel - T & G Douglas-Sherwood 182

79. The Whitlingham keel, stern framing and transom, also assistant James Petts. 183

80. Transom stern of the Whitlingham keel - T & G Douglas-Sherwood 185

81. Starboard knee of the Whitlingham keel - T & G Douglas-Sherwood. 186

82. Forward port side section at the forward horizontal knee of the Whitlingham keel - T & G Douglas-Sherwood. 187

83. The Whitlingham keel, forward port side and forward horizontal knee. 188

84. The Whitlingham keel: transom stern general arrangement sketch - G Douglas-Sherwood. 190

85. The Whitlingham keel, aft hold wall, stern framing and transom. 191

86. The Whitlingham keel, aft hold wall, horizontal knee on port side. 192

87. The Whitlingham keel, forward view of bow, port side. 194

88. The Whitlingham keel, frames under inner planking near forward horizontal knee on port side. 195

89. The Whitlingham keel, frames under inner planking amidships on port side. 196

90. The Whitlingham keel, upright knees supporting port side deck. 197

91. The Whitlingham keel, coaming stanchion on port side. 198

92. The Whitlingham keel, view along starboard side. 200

93. The Whitlingham keel, starboard side deck. 201

94. The Whitlingham keel, wedge Depositor support with plank. 202

95. The Whitlingham keel, rebate in plank for Depositor support. 203

96. The Whitlingham keel, Depositor support forward of amidships on port side. 205

97. The Whitlingham keel, Depositor support aft of amidships on port side. 206

98. The Whitlingham keel, upright Depositor supports on port side. 207

99. The Whitlingham keel - suggested Depositor support reconstruction. 208

100. The Whitlingham keel, framework in forepeak. 209

101. The Whitlingham keel, forward ring, port side. 210

102. The Whitlingham keel, second ring, port side. 211

103. The Whitlingham keel, second ring, port side. 212

104. The Whitlingham keel, third ring and plate, port side. 213

105. The Whitlingham keel, third ring and plate, port side. 214

Introduction

The East Anglian waterways are one of the most extensive navigable networks in Great Britain. The most dramatic traditional local boats thereon have long been recognised as the Norfolk keel and the Norfolk wherry. In spite of this recognition, little has been written concerning the Norfolk keel and its relative significance in the economic development of east Norfolk and north Suffolk.

Domestic craft have a special place in British maritime history, and many have been well recorded by such figures as Eric McKee, GS Laird Clowes, Edgar J March, and members of the Society for Nautical Research. Much of this fine work has gone into the detailed description of coastal craft. Humber keels and sloops (John Frank) and the Rye river barges (Leopold A Vidler) have received special attention. However, scholarly work on the craft of the inland waterways of past centuries, barges and smaller river traffic, is not very extensive to date.

Roy Clarke's Black Sailed Traders, The keels and wherries of Norfolk and Suffolk appeals to the sentimental recall of the days of the sailing wherry, and suggests that the similarly clinker built Norfolk keel was "ancestor" to the wherry, also bearing relations still further distant as descendant to the Saxon "ceols". The following describes the Norfolk "keel" as a genre of boat, not a "keel" in terms of the longitudinal strengthening member of a boat. "Keel" as a term has been applied to various barges, usually flat-bottomed and broad-beamed. Richard Unger's more scholarly

examination of The Ship in the Medieval Economy recognises the "keel" type as an important key to the development of navigation and trade around Great Britain:

> "How much the last owed to the Scandinavian cargo ship of the eighth century is not know but, by the fifteenth century, there were at least three different forms of keel each with a single mast and a single square sail." [1]

Although Robert Malster's Wherries and Waterways traces an outline of Norfolk keels, he concentrates more fully on the surviving Norfolk wherry. On the older Norfolk keels, the more scholarly have generally confined themselves to tentative descriptions such as "found to have square sails" (Eric McKee).[2]

In the following, the Norfolk keels are detailed. In Part I, "Navigation and trade", through documentary sources, describing their area of origin and application; in Part II, "A pictorial account of Norfolk Keels", through iconographic or pictorial sources, describing their outline hull shape and rig of the eighteenth and nineteenth centuries; in Part III, "The last of the Norfolk keels", through contemporary documentation (including two ship models) of the last known working Norfolk keel; and in Part IV, "The Whitlingham keel", through the example of a recovered Norfolk keel.

The thesis concludes with an epilogue, an assessment of the limits of the information utilised, and suggestions on areas of research which could further detail Norfolk keels or other inland waterway craft of East Anglia.

Footnotes are numbered to each section. Footnotes to Parts I and II, and the combined footnotes to Parts III and IV, are placed after the epilogue.

1. Richard W Unger. The Ship in the Medieval Economy. (London, Croom Helm, 1980). pps 204-205.
2. Eric McKee. Working Boats of Britain. (London, Conway Maritime Press, 1983). p 74.

Part I

Navigation and Trade

Part I

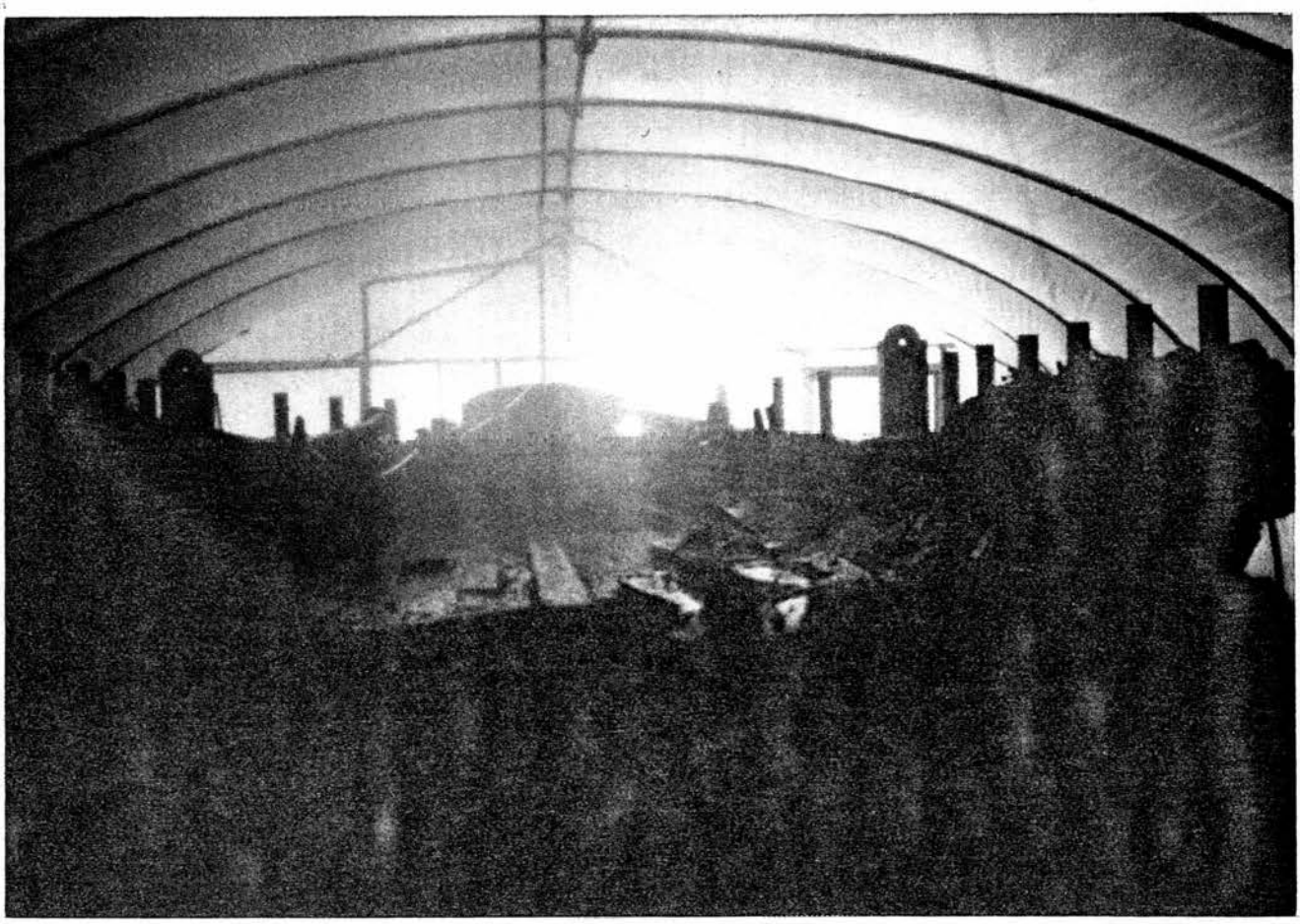
Navigation and Trade

In line with the new spirit of organisation which characterised the latter part of the eighteenth century and the turn into the nineteenth century, a series of Acts relating to inland waterways and vessels were passed by Parliament. The registry and navigation acts of the eighteenth and nineteenth centuries provided the basis for Acts of more generally encompassing nature, such as the Act of General Registry 1786 (for all seagoing shipping), and the later Merchant Shipping Act of 1894[1]. Navigation Acts concerning east Norfolk and Suffolk allow a view of the effects of waterway improvements on shipping types, and can further colour the impact of trade on the keels as the principle means of transport and communication.

Navigation and Trade in East Norfolk to 1800

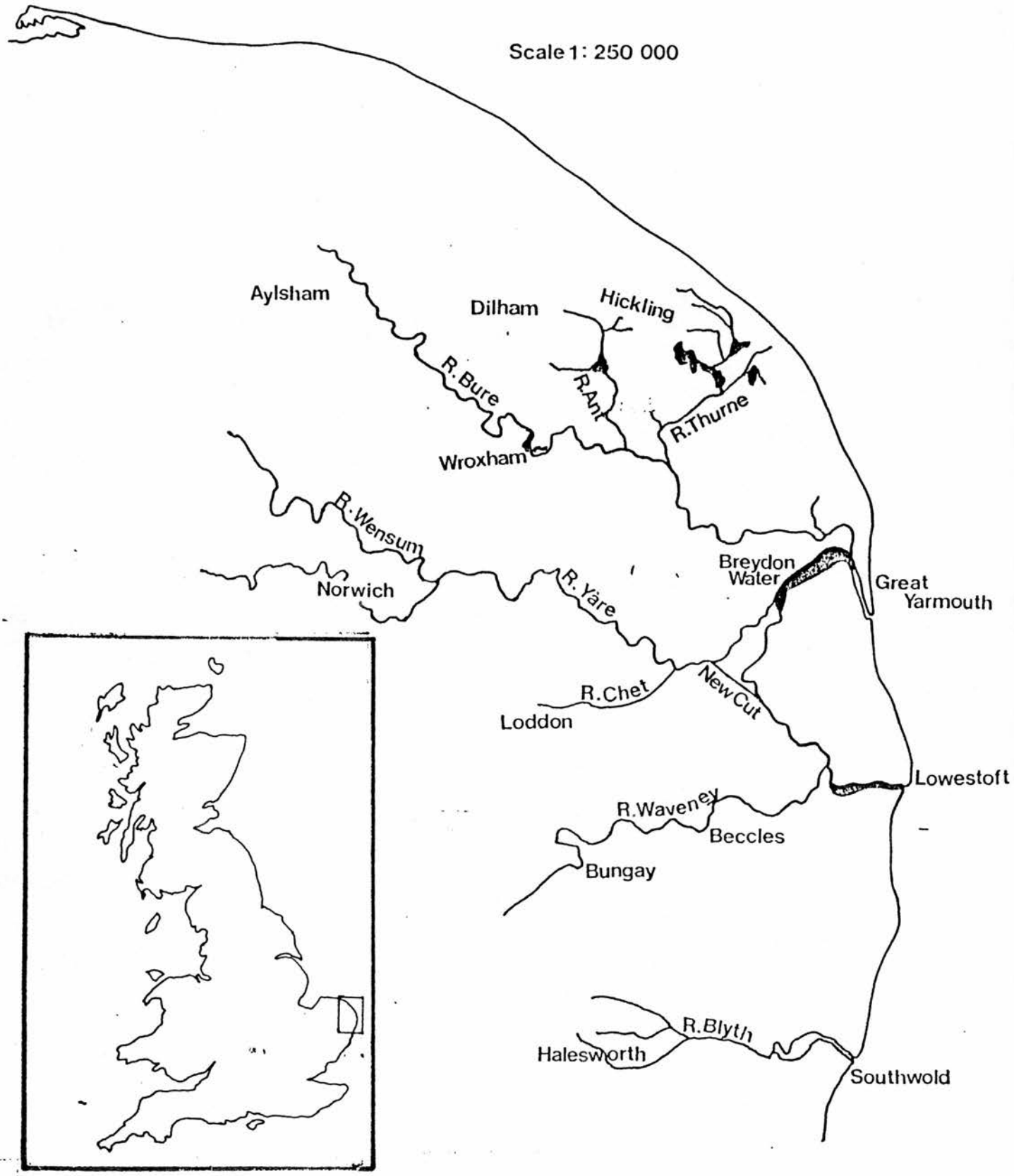
From the late seventeenth century, many Acts of Parliament were passed to allow improvements to ports, harbours, and inland navigations. Many of these refer to the types of vessels in use on the rivers, and seek toll payment from them as a means of paying for improvements. The type and size of vessels on the east Norfolk system (Plate 2) changes with the waterways.

The Yare and its opening into Breydon at Great Yarmouth has a complex navigation history. Great Yarmouth's position as a port depended largely upon the maintenance of internal communication by water. Norwich was the capital to the region, and as an inland



1

EAST NORFOLK - PRINCIPAL NAVIGATION



industrial centre had to have good navigation on the river to the port. The port and city were interdependent. The Scottish poet, Arthur Johnston (1587-1641) recalls the status offered to Norwich:

> Omnia sic adeo haec sibi sufficit ut si
> Fors regno desit, haec capit esse quat

In translation:

> This city, self-supplied, should England need
> A capital, might fairly take the lead.

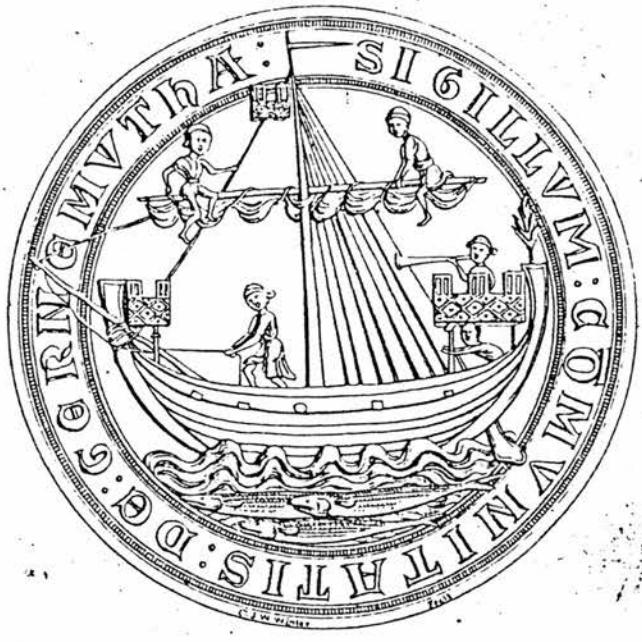
During the seventeenth century Norwich was second only to London in assets, if not in size. The quality of navigation from Great Yarmouth was vitally important to its commercial life.

The port and city had not always acted in complement with each other. Norwich regarded itself as a "port", a view established long before the "Yare-mouth" town had come into existence. In contention wit this, Yarmouth considered itself as having the principal place as port, as evinced by the 13th century town seal, which displays in very stylised form a double ended decked ship with single central mast and yard[2] (Plate 3).

The port town and city continually came into dispute over the rights to exact tolls and control shipping. The Norwich citizens pleaded with the King as early as 1327 that the city had prior right over Yarmouth as:

> "a mercantile and trading town, and one of the Royal cities of England, situate on the bank of a water and arm of the sea, which extended from thence to the main ocean, upon which, ships, boats, and other vessels have immemorially come to their market ... all this long before Yarmouth was in being, even when the place which that now stands upon, was main sea".[3]

YARMOUTH BAILIFF'S SEAL



The King intervened to settle this squabble by threatening that "if any hindered or in any way molested, the merchant vessels of what kind whatsoever from passing and repassing through the port of Yarmouth, to and from the city of Norwich, that they should forfeit all their goods and chattels". Yarmouth nevertheless established its rights as a port separate to those of Norwich, having the advantage of access to free water beyond the river system, and by the fifteen century became home to vessels with larger interests than inland navigation, as evinced by the fifteenth century bailiff's seal[4] (Plate 3).

The Yare became even more closed by the build up of the sandbank, first noted in the fifth century[5] Breydon Water forming as an inland seawater lake. The rive channels leading into Breydon also gradually became more silted, until by the seventeenth century the people of Norfolk came to recognise that they must cooperate and intervene to retain navigable waterways, most especially the main channel between the city of Norwich and the port of Great Yarmouth.

Barges on the inland waterway were already quite diverse in size, use, and form - a bill of sale of the sixteenth century describes a keel with two masts[6], one of many keeps noted of around 20 tons, which plied the regular trade between the post and city and which were used as lighters or for coastal voyages of short distances[7]. In 1663, the problems of maintaining navigation on a slow moving river system were first highlighted by the Commission of Sewers "who decreed that the Yare should be made 22 yards wide", probably taking boats of "20 to 30 tons". In 1670 the Port and Haven Commission of Yarmouth was first formed by Act of Parliament,

to administer harbour finance and maintenance. Further to this, an act of 1698 required a duty payment "of not more than 1s per London chaldron of coals, or per ton, or last of other goods ... to be used towards maintaining the piers and haven and deepening the river to Norwich"[8].

The Waveney in the early seventeenth century could not provide water for lighters to Geldestone or Bungay. In 1670, Bungay was described as "very populous by trade and commerce the want thereof hath reduced the inhabitants to great poverty". The Waveney upriver of Beccles was so shallow that "keeles, lighters and other boats cannot pass". To alleviate this situation in October of that year, an Act was passed to make the River Waveney navigable to Bungay, in order to allow the town to import via Yarmouth "sea Coales and other merchandise and commodities" and to export their own products, which included canvas for the Yarmouth fishing fleet[9]. Locks were eventually constructed at Geldestone, Shipmeadow, Ellingham and Wainford, producing an income to cover costs of maintenance from the tolls exacted at these points. The Waveney, as suggested in the later 1795 Register of Inland Vessels, did not accommodate very large traffic, but did provide enough trade to warrant basing several smaller barges at Geldestone following improvements.

Nature did not speed her claim on the marshlands of the Yare, Bure and Waveney valleys quickly enough to cheat the eighteenth century verve for civil engineering, improving rivers and creating canals to serve the expansion of waterborne trade of England. The navigation Acts marked the more major changes facing the people of east Norfolk, and the legislators, from 1700.

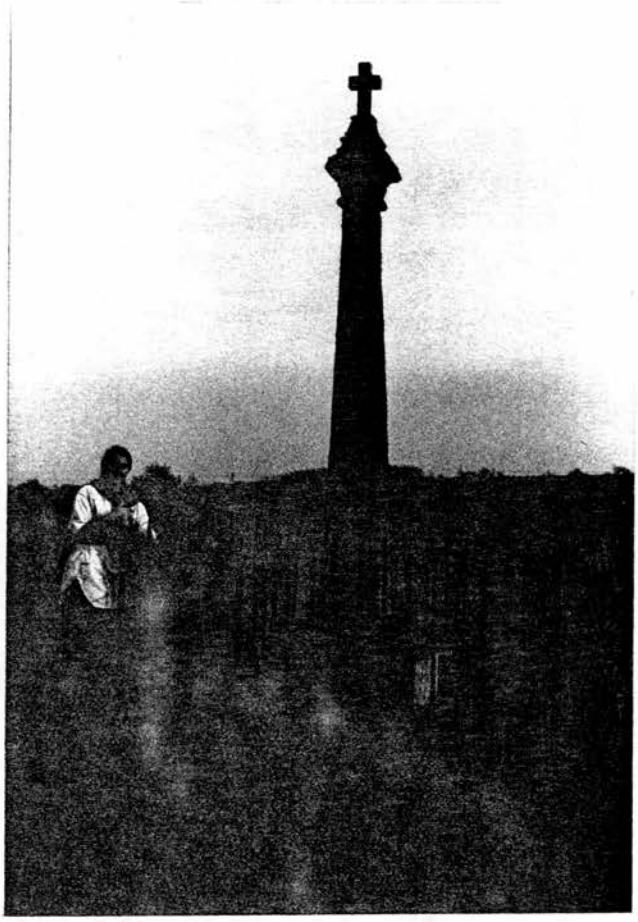
At the turn of the eighteenth century, keels were already of some considerable size, as suggested by a contract of 23rd February 1700 between "the Mayor Aldermen Burgesses and Committee of the Town of Great Yarmouth on the one part and Mrs Anne Ingram and Mrs Alice Partridge"[10] who were evidently keel-owning keelmen's widows. The widows "lett unto the said town their severall keels" fetching ballast from the haven mouth. These had to be manned with "two or more able men", and used to transfer ballast to ships in harbour, "to the full weight of thirty tons" or if "underladen for as many tons as they want in proportion to the pay of a whole keel". These keels were evidently capable of both dealing with sea conditions at the harbour mouth, and carrying quite substantial cargoes on the main river course.

To improve the river trade, waterways had to be further improved also, and money was sought for this purpose. In 1705 Great Yarmouth had settled means of receiving an income for maintenance of her waterway and facilities. "Orders for regulating the bridge and collecting the tolls thereat" from the 5th March of that year required that the "bridgemaster shall keep a just account in writing of very ship or vessel new or old and of every boat or keel passing through the bridge for which the leaves of the said bridge must be unlocked" to be paid to the chamberlain of the town. A distinction was made as to the purposes of the vessels - "for every old ship, boat or keel passing through ... there shall be first paid one shilling except for fisher boats for time when they pass through the bridge to fitt for a fishing voyage and belonging to freemen of this burgh they to pay only sixpence for such passing". Great Yarmouth

also emphasised her control of the river entry to her fellow Norfolk townsmen by making a distinction between her own vessels and those of the towns on the inland river system - "for all ships boats and keels passing through the bridge and belonging to unfreemen of this burgh there shall be double duties paid"[11]. The port consequently received dues in proportion to the vessel's use on the rivers: from the following year, Great Yarmouth was required to pay Norwich £25 per annum for the maintenance of the Waveney and Bure, drawn out of dues paid on coal imports. The city and port were forced to cooperate to enable them both to benefit.

The toll system was successful, but the increasing trade of Norfolk, brought about by the revolution in agricultural techniques and greater production of corn, required more improvements to the rivers as means of communication. In 1723 an Act was passed "for clearing, depthning, extending, maintaining, and improving the haven and piers of Great Yarmouth, and for depthning and making more navigable the several rivers emptying themselves into the said town ... the channels of that part of the River Yare, leading from Great Yarmouth to Norwich, called Braydon, and that part lying between the New Mills in Norwich, and Hardley - cross in Hardley, and also the rivers Waveney and Bure, commonly called the North River, are to be depthned and made more navigable for boats and keels"[12] (Plates 4, 5).

The 1723 Act recognised and emphasised the importance of the keels as the main means of transport. The "depthning" of the "several rivers" dictated the fortunes of the east Norfolk towns, which were dependent on their accessibility to the barges for



4


Repaired
A.D.
1826
REPARATA
TEMPORE
THOMÆ
C. HICKERING
ARMIGERI
MAIORIS
CIVITATIS NOR
1676

5

transporting their products (grain, wool, livestock, wood). The down of Dilham is specifically mentioned as required an improved navigation from St Bennet's Abbey on the Bure: which led to the River Ant gaining greater status as a waterway, through being able to accept sailing barges.

Kirkpatrick's Prospect of Norwich of 1723[13] includes cameos of keels on the Wensum at Norwich, such inclusion stating their importance. The city became well noted as an industrial centre. Daniel Defoe, in his Tour through the Eastern Counties, first published in 1974[14], considered it a peculiar place, "the inhabitants being all busy at their manufactures, dwell in their garrets at their looms and in their combing-shops, so they call them, twisting-mills, and other work-houses, almost all the works they are employed in being indoors. Wood manufacturing was of vital important to Norwich: "The chief manufactory is Worsted stuffs, it is reckoned there is annual sold to the value of £200,000 ... the houses are computed 7000 and the people 420,000"[15].

Norwich increasingly became the principal target for the barges from Yarmouth. Tolls at Norwich, like those at Great Yarmouth, allowed the town to pay for improvements. A tonnage Act of 1726 not only indicates the wear and tear the increasing number of vessels was having on the city "walls, gates, bridges, wastes, staths, and wharfs", but lists the tolls by means of which the city gained the means to repair them: "paid by every master ... of any boat, keel, wherry, lighter, hoy or other vessel"[16]. Few of the toll records of 1726 survive[17], but according to the act, tolls were exacted on: every chaldron of coals by Winchester measure - 4d.;

each last of rye, barley, malt, or grain - 4d; sugar, tobacco, molasses - 4d for 3 hogsheads. Rope, raisins, oil, pitch, tar, nails, iron, millstones, grindstones, pantiles and building stone - all made or base goods for the city were carried by water, and all were taxed. A boom was allowed to cross the river within the city, where an appointed officer could "let pass all boats, wherries, keels &c on giving an account of their lading, and paying the duty"[18]. A city map of 1727 shows this at a point just upriver of the south gates, where the river was "navigable for keeles of 40 or 50 tunns"[19].

From 1750, with the improvements to wool production and weaving machinery, the river trade to Norwich, and exports, increased. Along with a commitment to keep the main river channels clear, Norwich improved its facilities for the barges within the city boundaries. Freemen of the city between the years 1714 and 1752 include Henry Croskill, a ship carpenter, and Josiah Ridgewell, a ropemaker, both sons of worsted weavers; James Barnby, a sail-maker; and Nathaniel Abree, a shipwright[20]. A map of the city of 1766 by Samuel King[21] shows seven staithes, or barge inlets: New Com Staithe (later known as Wherry Staithe, at Conisford Street, which runs parallel to the river above the South Gates), Music House Staithe (in Water Lane), Old Com Staithe and Briggs Staithe (at Cockey Lane), St Anns's Staithe (near the north east bend in the Wensum), St Margaret's Staithe (in the north west of the city), and Sandling's ferry, which is the name given to the river inlet to the cathedral, as seen in the South East Prospect of the City of Norwich[22]. Samuel King's added comment to the pride of the waterway,

stating that "The River Wensum is navigable for keels of fifty or sixty tons" - also indicates a further increase in the size of the vessels since the 1727 Corbridge map's 40 to 50 ton vessels, and the seventeenth century, when the Commissioner of Sewers took the citizens of Norfolk to task regarding vessels of 20 tons.

Tolls from the port and city were not enough in themselves to extend navigation on the north rivers. The 1773 Act for making and extending the navigation of the River Bure by and from Coltishall to Aylsham Bridge allowed a greater area to be serviced by the barges. The more northerly areas, thanks to the innovations of the industrial revolution in terms of animal husbandry, crop planting and harvesting, were producing greater quantities of foodstuffs and materials than the merchants could easily transport by cart. Following navigation improvements the Bure came to carry these, as well as improving all round communication. An account of goods exported through Great Yarmouth of the period from 1780 - 1810 shows a tremendous turnover of goods carried by the keels out of the market towns. Where Norwich expanded from the worsted trade, the farmers of the county boasted an average grain export (to London and the continent) in the ten years up to 1790 of:
83,845 quarters barley, 113,979 quarters malt, 6,990 quarters oats, 15,421 quarters pease, 5,418 quarters beans, 30,248 quarters flour, 4,540 quarters meal[23].

Keels were seen regularly in use to ships in the roads outside the Yarmouth haven[24] or transporting ballast, and occasionally moved along the coast. Halesworth in Suffolk, like the north east Norfolk towns "carried on a considerable trade in malt,

grain, timber and general merchandize"[25]. Like the Norfolk towns, it required better transport to improve its trade, and in 1761 the Blyth navigation was opened. As the most appropriate and useful craft, Norfolk keels were bought for the Blyth, and sailed from Yarmouth along the coast to become the first vessels used thereon.

The improved Norfolk waterways allowed an increased size and number of keels and ships. An example of dimension is given in The Norwich Mercury of February 27th 1779 which advertises the auction sale of a fifty ton keel, the Hand In Hand, and on October 23rd that year, the 50 ton John and Joseph, described as a "hatch keel". In 1779 Great Yarmouth is "very advantageously situated; having the benefit of the rivers Bure, Yare and Waveney, navigable for keels of forty tons burthen"[26]. Upriver of the haven bridge on the Bure, the North Quay provided mooring for keels, the open area in front of the town buildings providing connective space for trans-shipment from the seagoing vessels moored at the Broad Quay and South Quay, which extended downriver of the bridge to the southern town walls[27]. A contemporary diarist, the Reverend Richard Turner describes the activity: "The river to the south of the bridge is occupied by shipping, and the quay upon this part is the ornament and boast of the town: smaller quays to the north of the bridge are occupied by keels and wherries which belong to Norwich and the towns connected with the rivers ..."[28].

Where Norwich was recognised for its industry, by 1790 Great Yarmouth had been recognised as the central pivot point for all barge, import and export traffic. Nearby Breydon Water connected all waterborne river traffic routes, like a latter day watery

roundabout, and the Kirkley roads outside the rivermouth sand banks provided offshore anchorages for unloading. As well its own tremendous herring fishing industry, Great Yarmouth was a base for import - "a brisk trade to Holland, Norway, and the Baltic for deals, oak, pitch, tar, and all other naval stores" - having become a navy dockyard. Exports included corn, malt "to 220,000 quarters a year" and "the shipping of the greater part of the stuffs manufactured in Norwich for foreign markets"[29], whilst imports included 36,000 chaldrons of coal, to serve all these major industries. These factors all contributed to the increase in numbers and size of inland barges transporting goods from inland.

The traffic between port and city became well regulated, the Norfolk memorandum book noting passengers services "from the Wherry Staithe every Monday and Thursday for Yarmouth, and return(ing) on Tuesdays and Fridays"[30]. Improved organisation also allowed the establishment of a Watermen's Society, to allow an insurance cover for Masters of crafts or their associates unable to work due to illness or injury[31].

The Registration of Vessels on Inland Waters

In the latter half of the eighteenth century, all waterborne activity at the port of Great Yarmouth, served by the rivers Bure, Yare and Waveney, which carried goods from the principal towns of east Norfolk and north Suffolk, and their small local boats and boatmen, were affected by improvements to navigation; by the economic growth of Norfolk; and by the national state of war.

The small barges which maintained the movement of goods along

the rivers and the east coast were capable of carrying large quantities of goods or numbers of men. The continuity of internal trade carriage of coal, iron, cloth and food stuffs, all interchangeable goods which were essential to the economy of eighteenth century towns, relied on them. Many barges could be used either on rivers or at sea, and rigged accordingly. These conditions encouraged both development of boat types and the conditions in which they functioned.

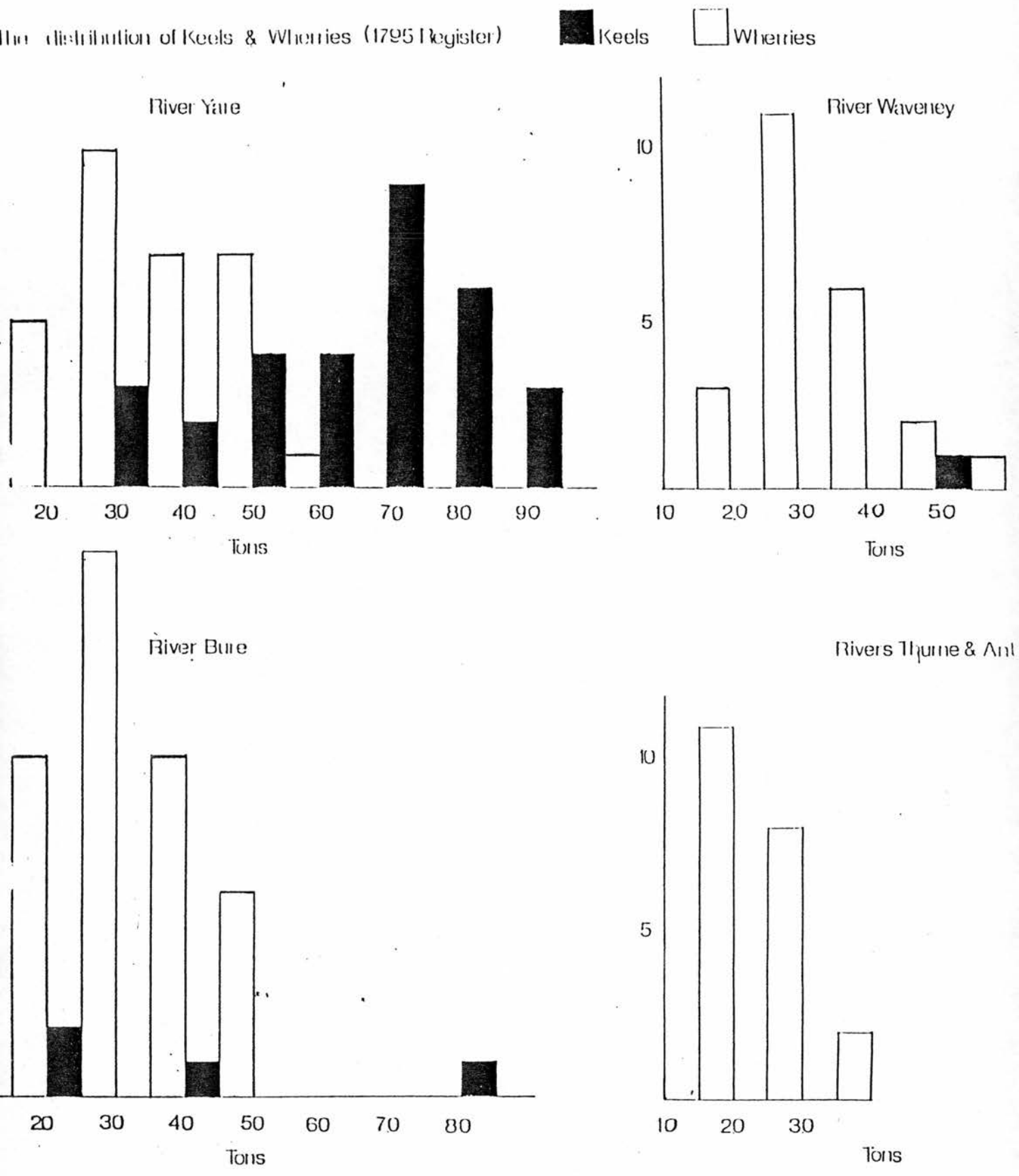
An Act passed in 1795 required "all Boats, Barges, and other Vessels, of certain Descriptions, used on navigable rivers, and on inland Navigations, in Great Britain, to be registered"[32] (Appendix I). The 1795 Act allowed government the opportunity to identify vessels and masters, navigation needs and types of cargo, and thereby regulate traffic, require licences or toll payments. The Act, for reasons both of internal economic assessment and national defence, enabled tracing of numbers and types of small vessels.

In Great Yarmouth, the town clerk registered vessels relating to the inland navigation of east Norfolk. The Bure, Yare and Waveney meet at Breydon Water, to the north west of the sea haven of Great Yarmouth. From 15th June 1795, the clerk was required to enforce the Act for "Every Lighter, Barge, Boat, Wherry or other Vessel, exceeding the Burthen of thirteen tons" using the river system, or working to trans-ship from larger vessels at the haven mouth. The 1795 Register not only provides a great deal of information on the numbers and sizes of Norfolk keels and their fellow vessels, but also gives us insights into some aspects of the men who manned them.

The Norfolk Register lists 155 vessels, from 10th July 1795. Of these, 116 were wherries, 36 were keels, and three were described as "boats". The Register allows one page for each vessel, giving its number in the Register, the name of the vessel, the date on which it was registered, the name of the master and waterman or boy (as crew), her principal route, and (in some cases) an estimate of the miles distance of the principal route. The established means of reckoning tonnage in Norfolk in 1795 is not certain, either from contemporary legislative documents or from the Register itself. Tonnage is most likely to have been reckoned as a measure of carrying capacity, and therefore equivalent to net registered tonnage.

There were far more wherries in relation to keels in eighteenth century Norfolk than has been indicated by past publications[33]. The number of keels is lower than that of the number of wherries. However, this does not in itself indicate that the former were being ousted as the principal boat form in east Norfolk by the latter. A table of the distribution of keels and wherries (Plate 6) indicates their distribution on the five main rivers of the east Norfolk navigation system as drawn from the Register, and their relative size (by tons). Gross tonnage by river is indicated:

The distribution of Keels & Wherries (1795 Register)



6

Keels

On River Yare	2045 tons	
On River Bure	168 tons	
On River Waveney	58 tons	(one vessel)

The gross overall tonnage of keels is 2271 tons, for 36 vessels, the mean vessel tonnage is 63 tons.

Wherries

On River Yare	878 tons
On River Bure	1114 tons
On River Thurne	188 tons
On River Ant	233 tons
On River Waveney	634 tons

The gross overall tonnage of wherries is 3047 tons, for 116 vessels, the mean vessel tonnage is 26 tons.

Compared with the number of wherries, the average keel was clearly capable of carrying a far greater tonnage of cargo. The 36 keels listed carry over two thirds the equivalent gross tonnage of the 116 wherries.

Whereas the largest keel listed is the Success (No. 131), at 97 tons burthen, the largest wherries are the Mayflower (No. 9) and the Endeavour (No. 128) at 50 tons burthen. The average size of wherries overall is smaller than that of keels. The smallest keel, the Venture (No. 100) at 20 tons is therefore near to the average size of wherry.

The square-rigged keels would not have been as fleet as smaller gaff-rigged wherries. This may in itself be an indication of the discrepancy in relative size - the keels handling cargoes that did not require speed of delivery, but were more competitively carried in bulk. To compete with the wherries, the keelmen would have opted for larger sized vessels. Although records of port

entries indicate what types of goods were being imported or trans-shipped at Great Yarmouth, few records specifically indicate which particular goods were carried in which particular types of vessels on the inland waterway system.

The rather brief remains of the records of tolls payable on entry to the city of Norwich of 1726[34], albeit much earlier than the Register, gives some indication of preference:

The keel Friendship on May 2nd delivered 37 tons of coals paying a duty of twelve shillings and fourpence;

The keel Elizabeth on May 2nd delivered 32 tons of groceries and baled goods (also a further 2.5 tons on the same day) paying a total duty of eleven shillings and sixpence.

The wherry Greyhound on May 3rd delivered 19.5 tons of linen and cloth paying a duty of six shillings and sixpence;

An unnamed lighter on May 4th delivered 25 tons of salt paying a duty of eight shillings and fourpence.

The bulkier cargoes, coal or baled goods, were carried by keel, lighter or delicate cargo by wherry. This small remaining excerpt is not, however, enough material on which to base a judgement of particular preference between the two boat types for particular cargoes. A clearer determination may be gathered from the Register itself, by matching boat sizes and types to the main routes, thereby principal towns, each with its principal marketed goods, which they served. The width and depth of the rivers dictated the size and type of vessels which could use them. Appendix III indicates which rivers the keels and wherries worked, and in most instances the estimated working distance for carriage.

The rivers are defined as "north" or "south" according to their point of origin in relation to the city of Norwich.

The North Rivers

The "North River" Bure and its tributaries, the Thurne and the Ant, more directly served the market towns of the most easterly farming regions of the county. There are 64 wherries listed on the north rivers, 6 keels, and 3 boats. Most of the keels were of less than average size: the Trial (No. 99) at 40 tons, the Venture (No. 100) at 20 tons, the Two Friends (No. 120) at 28 tons, and the Quick Dispatch (No. 148) at 45 tons. The July Flowers (No. 138) at 80 tons was by far the largest vessel in use on the Bure, and would probably have held a distinct place for carriage of livestock, building materials or bulkier cargoes to and from the market town of Coltishall.

Coltishall acted as the largest market town centred on the Bure prior to the extension of navigation to Aylsham in 1773. Nine wherries and one keel list Coltishall as their parent town, where seven wherries name Aylsham, which like Coltishall to the south was again a market town serving part of the north east section of the county. The 43 wherries concerned principally with Bure navigation range in size from the 43 ton William and Betsy (No. 27) to the 14 tons burthen Maud (No. 71), only 12 of these being over 30 tons burthen, the mathematical average being approximately 26 tons.

The tributary rivers to the Bure, the Ant and the Thurne were clearly limited in width and depth: the 21 wherries on these two rivers range in size from the 30 ton Friends Lucreave and the Joy

(Nos. 28, 88) to the 14 tons burthen Sarah or the Friends Adventure (Nos. 112, 113), only 7 were over 20 tons burthen, the average being approximately 20 tons. There are no keels listed as working principally on either the Ant or the Thurne.

The three "boats" listed, possibly rowed craft as seen in the South West Prospect of the town of Great Yarmouth by Corbridge of 1742, are also concerned with these rivers:

No.	Name	Tonnage	Route	River
29.	Mayflower	14	Martham	Thurne
40.	Active	16	Barton Turf	Ant
43.	Britannia	16	Stalham	Ant

Total: 46 tons

"Boats" may well come under the distinction outlined in the act for any craft "that shall be worked, rowed, or navigated in or upon any river ...". Undoubtedly the commissioners or clerk concerned would have been able to identify an vessel type otherwise by its rig.

Vessels in use on the Ant and Thurne would have had distinct problems with carriage of heavier building goods, but these may have reached the towns by an alternative route - the coastline at Sea Paling being perhaps suitable for beaching of barge craft for unloading for Stalham, and at Winterton for unloading for Martham. Goods such as leather, small numbers of livestock, or grain, could

still be sent downriver from the farming communities.

It is possible that there was trans-shipment of goods to larger vessels once the smaller wherries or boats on the Thurne or Ant had reached the Bure, at Acle or Stokesby. However, the relatively short distnace to Yarmouth from the mouths of the Ant or the Thurne suggests that such trans-shipment would have been a time consuming, possibly costly exercise for the sailing vessels.

The towns reliant on these rivers would have been in a poor position to compete with others on wider or more easily navigable rivers - such conditions encouraging both producers and carriers to press for improvements to navigation.

The north rivers were evidently more suited to the gaff rigged wherries than keels, there being a total tonnage for the 63 wherries on the north rivers of 1535 tons burthen, as against a total tonnage for the 5 keels of 168 tons burthen.

The South Rivers: The Waveney

The "south" River Waveney served the mostly southerly part of east Norfolk, itself acting as the dividing line with the county of Suffolk. Only one keel, the Royal Oak (No. 135) worked on this river, with 22 wherries. Its size at 58 tonnes burthen was less than average for a keel. The Endeavour at 50 tons burthen was the next largest Waveney vessel, both of those serving the town of Bungay.

As with the north rivers, the Waveney was confined in its use of larger vessels due to problems of river width and water depth. The 22 wherries range in size from 50 to 10 tons, 14 of these being

under 30 tons burthen, only 3 over 40 tons burthen.

The smallest vessel listed, the 10 ton burthen Benjamin wherry, in use from Geldstone on the Waveney, does not come within the Acts' distinction of "exceeding the burthen of thirteen tons" - the clerk clearly affording himself the licence to register a class of vessel that has been known to be laden to the point where water can run over the decks[35].

The Yare

The keels worked principally on the River Yare, which served to connect the city of Norwich most directly with the port of Great Yarmouth. The Yare carried 30 keels and 29 wherries. Although Norwich also served as the market town for the farming areas to the west of the city, its trade was more directly concerned with the import of made goods and heavier heating or building materials, having resident wealthy merchants who could afford brick and tile built housing, and tradesmen concerned with made goods for export, such as shoes and ales.

The almost even number of keels and wherries on the Yare conceals the principal distinction between these two types as suiting employment on the different parts of the river system - the 30 keels range in size from the Success at 97 tons to the Suasanna and the Duck at 30 tons burthen - only four of these being under 50 tons burthen, and making a mathematical average of 68 tons.

The 29 wherries on the Yare route range in size from the Mayflower at 50 tons to the James & Elizabeth at 15 tons burthen - 22 of these being under 40 tons burthen, the mathematical average

being 30 tons.

The keelmen favoured the Yare with a total tonnage burthen in the 30 keels of 2045 tons. Wherrymen carried much less with their 29 wherries, totalling 878 tons on the Yare.

The distinct predominance of keels on the Yare, as the largest and widest river in East Norfolk, which served the largest town, or city of Norwich, suggests that these were used as largest bulk or heavy goods carriers. Keels may be seen as a distinct class of vessel, even though sharing several common attributes in structure with the smaller wherries. Their sailing characteristic, of pulling great weight with large square sail, would also have made them appear more akin to the predominantly notable seagoing vessels of the eighteenth century - the three masted, square rigged cargo vessels and fighting ships. Gaff rigged boats were seen to be more suited to lighter duties requiring some speed.

The Norwich to Great Yarmouth route on the Yare was the busiest in the inland water system and the keels the outstanding craft thereon.

Parent Towns

The great majority of keels listed in the Register describe their parent towns as being either Norwich, with 10 keels, or Great Yarmouth, with 21 keels. Of the remaining five keels on the Register, another was based at Reedham on the Yare, three on the Bure at Aylsham or Coltishall, and one on the Waveney at Bungay.

The predominant parent towns for Yare wherries are Norwich with fourteen, and Great Yarmouth with nine. Other wherries are listed as belonging to 43 other small towns on the Bure or Waveney.

The keels, belonging to the more substantial city or port, can thereby be seen as further distinct from the majority of vessels using the river system. The wherries, as smaller and therefore cheaper to build vessels, were often based at the less wealthy centres.

Builders' Yards

As can be seen in the early nineteenth century painting by John Thirtle, Boat Builder's yard near Cow Tower, Norwich[36], the men who worked on the building and use of inland boats from Norwich were an important part of the economic life of the city. The waterways were important to trade and communication, the waterside therefore a valuable area. Details of a land auction at Norwich place "Lot XIV. An Old Established Boat Builders Yard"[37], with a frontage of 91 feet to the river, at a point just downriver of the city Southgates. Vessels built at Norwich were unlikely to be seagoing merchant class - the city which later claimed position as a port itself could nevertheless provide its own barge fleet to some extent. The "Prospects" of Yarmouth also indicate that boatbuilding took place inside the town walls[38].

Wherries, of much smaller dimensions, could be built at any appropriate waterside point - the parent towns of the vessels listed on the Register providing their own facilities and local builders. The size of all these vessels would have been dictated by the water depth available for launching, as well as for consequent use. Geldstone situated at a point on the Waveney where locks were installed to retain upriver water depth for Bungay, is listed as

parent town to six wherries - the wide and flat valley area being suitable waterside land for building.

Masters

There is no greatly marked commonality in family name ownership of keels and wherries to be seen from the Register, although further study of parish records may well indicate less apparent family connections between keelmen and wherrymen. That keel barging was a respected trade from quite early in the history of Norwich is indicated by the lists of freemen of Norwich[39]. First of these is Petrus Lovedaye, made freeman in the second year of the reign of Edward VI. Of the 24 keelmen-freemen, two further Lovedayes appear, both appointed in 1613. Such name commonality does suggest a background of family tradition in the keel trade.

In the 1795 Register, some vessels were registered on the same day with same surname masters, such as the Perseverance and the Lutsepid (Nos. 58, 59) registered by Messrs Stephen and R Darby, both based at Wainford on the Waveney. John and Valentine Reeve, both of Great Yarmouth, also registered their respective 24 ton wherry John & Sarah and 30 ton keel, the Duck (Nos. 38, 39) on the same day. Such grouping may further suggest that pairs or groups of vessels travelled together on the river system.

Thomas Purdy, Master of the wherry Fair Trader (No. 24) lists T Purdy Jnr (boy) as crew, which suggests a family connection between them. The Mayhew named group were masters of three wherries, the Active (No. 75), the Betsey (No. 113) and the Two Williams (No. 134), all of which were based on the Waveney, at

Beccles or nearby Geldestone. William Holland of the wherry Waveney, and William Holland the elder of the wherry Alert (Nos. 76, 77) registered on the same day, again from Geldestone. Such groupings of both name and parent town strongly suggest that the trade tended to expand within the experienced families.

The name Robert Kett, master of the 60 ton keel Elizabeth (No. 26) appears also as master(s) of the 50 ton keel Dolphin (No. 150), and 57 ton Flora (No. 154). This may suggest that some masters were registering different vessels in their own name, or that there are several Robert Ketts of different generations.

Master Elisha Royall of the keel Two Friends (No. 120) of Coltishall bears the same name as Chris Royall and C Royall Jnr (boy) of the wherry Douglas (No. 5). That there is a relationship between families and the tradition of barging in east Norfolk can still be seen today - the present generation of the family Royall, living at Wroxham, proudly boast both wherrymen and keelmen in their ancestry. Although no longer wherrymen, the present generation is concerned with the boat hire industry, their flag mast being a recovered wherry mast.

That there are few apparent family name connections between keel owners may be due to their apparent size - a family group may not have been able to maintain more than one of the larger keels. Clearly William Thomas, working a route to Norwich, Yarmouth and Coltishall, whether registering keels under his own name or with a relative of the same name, found keels worthwhile - the name appears as master of both the 85 ton Recovery (No. 72) and the 45 ton Quick Dispatch (No. 148), both based at Great Yarmouth. Robert Kett

retains the distinction of being the only Master's name afforded to three keels.

Wherry-owning groups from particular areas such as Bungay, where seven wherries list their parent towns, were also interested in keels where they could be navigated. There is no evidence that particular towns or family name groups preferred wherries rather than keels if their river was suitable.

There is some suggestion that vessels may have changed masters and ownership within the period represented by the register from September 1795 to January 1798. The keel Flora (No. 151) of 57 tons burthen listed under Roger Page as master and registered on the first of January 1796, working from Great Yarmouth to Norwich bears striking similarity in all its registered detail to the Flora (No. 154) registered with Robert Kett as master in January 1797. There is no certain indication, however, as there is a striking lack of imagination in the naming of vessels, with several under different masters and of varying size, being registered with the same or similar names.

Names of Vessels

The naming of vessels can sometimes give an indication of common interest in the owners or masters. The Great Yarmouth clerk would no doubt have felt some frustration when presented with the keel William (No. 12) of 70 tons, and another keel William (No. 14) of 60 tons, on consecutive days, interspersed by a keel named the William & Mary (No. 13). That the keelmen and wherrymen were not averse to "having a game" with the local civil servants is further

indicated by the favour shown to particular names. Two wherries, both named the Coltishall (Nos. 85, 86) presented on the same day, from the same parent town, and varying in size by only 4 tons burthen would no doubt have demonstrated admirable home town patriotism, but also have strained the patience of a weary clerk.

There are five wherries and one boat named the Mayflower (Nos. 9, 11, 15, 29, 65, 118) varying in size from 14 to 50 tons burthen, all owned by different named masters and coming from both Yare and Bure. A declared fondness for the New World's famous vessel of the same name would not perhaps have been appropriate at a time so shortly following the American Declaration of Independence and in view of England's then present state of war.

Another well favoured name was Friendship (Nos. 10, 23, 35, 47, 95), varied as Friends Increase (Nos. 34, 36, 93), Friends Lucreave (No. 28), Friends Adventure (No. 113), Two Friends (No. 120), or Thomas's Friendship (No. 121). Two of these friendly vessels were keels, from Great Yarmouth and from Coltishall. There is no connection between the names of the masters, although most were based on the north rivers. The famous Friends Society of Quakers could be seen as prompting such naming - however, no correlations of the masters' family names or parent towns with Quakers has as yet been discovered. Friendship in itself could be the encouragement for the naming of these vessels.

The naming preference of the vessels' masters may be broken down into main areas: personal names such as John, or Elizabeth; place names such as Loddon or Oxnead; nature names such as Beehive or Wheatsheaf, attributive names such as Success, Constitution, or

Fair Trader. Many in the first of these groups may carry a patriotic flavour, the Royal George (wherry) being the most distinct of these. Place names are commonly ascribed out of pride for the home town, where nature naming may in itself be a quite unromantic indication of status, such as the Duck (keel), or of interset, such as the Wheatsheaf (wherry). The most common type of name is attributive - 75 of the vessels listed have names indicating more philosophical characteristics. A strongly Christian eighteenth century England may well account for such aspirations in naming of vessels.

Keels appear in all four categories, 15 keels bearing personal names, one, the London Lady (No. 74) with a place name, 6 bearing nature names, and 14 bearing attributive names.

The Register provides an outline of the numbers and sizes of Norfolk keels, and Norfolk wherries, their principal routes, and parent towns, at the end of the eighteenth century.

Keels were generally the larger vessels. They were concerned mainly with carriage between the principal port and town of their region. Their gross tonnage on the River Yare was over one third of that for the east Norfolk inland waterways, their burthen capacity far greater than that of other contemporary boat designs, allowing them to compete well overall.

Navigation and Trade in East Norfolk after 1800

The eighteenth century had shown some improvements in navigation communication for Norfolk, but not enough to keep up with the vast expansion of trading demands. At the turn of the

nineteenth century, Britain was at war with France, and the Navy required men, shipping and supplies. The riverways were thronged with craft, the 155 vessels listed on the 1795 Register complimenting the seaward haven of Great Yarmouth where numbers of fishing, whaling, and fighting vessels were built, ballasted or fitted out. By registering themselves, crew and vessel, the keelmen and wherrymen escaped impressment. Keelmen were seen as essential to the smooth running of the transport system, as further proven in 1803 when keelmen on the Tyne brought all coal carriage to a halt as a protest when several were captured by the Tyne Regulating Officer[40].

Riverbanks and dredging, wharfs and staithes, were expensive to maintain. The economic success of any marketing town in the area was still dictated by its communication by river. With the close of war following the Battle of Waterloo in 1815, and the subsequent relaxation of export control, the businessmen of Norfolk again turned their minds to improving their means of communication for trade, and keels took pride of place as the main vessels of river transport.

The Norfolk farmers continued to supply vast amounts of grain for export. The average from 1800 to 1810 had increased overall:

> 662 quarters rye, 152,478 quarters barley,
> 30,908 quarters malt, 9,098 quarters oats,
> 11,185 quarters pease, 12,178 quarters beans,
> 24,819 quarters flour, 329 quarters meal[41]

In 1814 the county reached a peak figure of 480,000 quarters of grain exports[42].

Agrarian farmers in the north easterly part of the river

system, dependent on the Ant and Bure, met in 1811 to petition for improvements in their communications. In 1812, an Act was passed "for making a navigable canal from the Rivers Ant and Bure, at or near Wayford Bridge, near Dilham, to the towns of North Walsham and Antingham, in the County of Norfolk"[43]. Whereas the north end of the main Bure channel had been extended to reach Aylsham in 1773, the market town of North Walsham had suffered in competition through having to use the far more expensive mode of transport provided by cart. The new canal, or improved riverway, it was envisaged would "greatly facilitate and render more convenient and less expensive than at present the conveyance of all kinds of commodities ... to and from the ports of Great Yarmouth and London". The "Company of the North Walsham and Dilham Canal Navigation" was formed, but the new navigation was not opened until 1826. Four locks were introduced, the river widened and made navigable for barges, limited to small wherries of 12 tons and length of 50 feet[44].

The city of Norwich still boasted a prime position, importing "40,000 chaldrons of coal yearly, wine, fish, oil, Irish yarn, and all heavy goods"[45] and exporting cloths, malt products and made goods to all parts of Europe. This made a tremendous market for the service provided by the keel owners, but the Norwich merchants were dissatisfied with the transport system. Trans-shipping of all goods at Great Yarmouth was seen to be expensive and time consuming. The keelmen also continued their profitable trade of going out to ships at sea, when they could not come into the Yarmouth haven over the Yare mouth sand bar at low tide.

In 1814, the Norwich merchants came together to propose that

the Yare be improved so that seagoing vessels could reach Norwich directly, without trans-shipment, and appointed William Cubitt to design a scheme. His initial proposals were for a wider and deeper channel through the seawater lake of Breydon water. The keelmen, and Yarmouth's toll-taking corporation were against any plans for direct routing of sea traffic, as this would lose them carriage fees and tolls. Independent views were sought, but Thomas Telford did not regard making a channel for seagoing craft a problem, foreseeing "no injury"[46] to Yarmouth. The city and port nevertheless still refused to cooperate.

In 1820 a more far-reaching proposal was put forward, outlined after much protest and debate from citizens whose livelihood depended on the full use of Yarmouth and the north River Bure. Daniel Defoe had remarked on the possibilities as early as 1724 -

> "... the river Waveney is a considerable river and of a deep and full channel, navigable for large barges as high as Beccles. It runs for a course of about fifty miles between the two counties of Suffolk and Norfolk, as a boundary to both, and pushing on toward the sea, no one would doubt that when they see the river growing broader and deeper and going directly toward the sea ... within a mile of the main ocean ... would expect to see its entrance into the sea at that place and a noble harbour for ships at the mouth of it"[47].

A narrow bar of land separated the Waveney from the sea at Lowestoft. In 1827 an Act was passed to allow "the cutting, making, and maintaining a navigable Cut for the Transit and Passage of such Ships and other vessels from the said River Wensum, otherwise Yare" near the village of Reedham to St Olaves on the Waveney. In addition, Lowestoft was to be made a port by making a further cut from the Waveney to Oulton Broad, from Oulton Broad to Lake Lothing,

and from the Lake to the sea at Lowestoft, "in order to make the same Navigable for the Transit and Passage of such Ships and other Vessels ... and the making and maintaining a Port or Harbour on the Sea"[48].

The long debate first protested to the king in the fourteenth century appeared to have reaching a conclusion. The "New Cut" was opened in 1832, Norwich acting as a port to seagoing ships the following year. The tolls exacted to pay for these vast changes to riverborne traffic also illustrate the main trade goods or Norwich and Norfolk, mainly corn, leather goods, foodstuffs, alcoholic beverages, coal, and building material (Appendix IV). These were no longer all carried by river barges.

The Waveney benefited with the opening of Lowestoft; In 1831 an Act was passed to allow deepening and widening of the river between Oulton Broad and Beccles, "so as to make such Part of the same river navigable, as well for the Passage of Ships and other Seaborne Vessels as the same now is for wherries, keels, boats, and other small Vessels and Craft[9] - all this again to be paid for by tolls exacted upon the river traffic. The "London, Lowestoft, Norwich and Beccles Shipping and Trading Company" was able to advertise a regular weekly service by schooner within two years.

Great Yarmouth was allowed some equality in all the changes to waterborne trade patterns. In 1835 an Act was passed for "clearing, depthening, repairing, maintaining and improving the Haven and Piers of Great Yarmouth, and for depthening and making more navigable the several rivers emptying themselves into the said Haven, and for preserving Ships wintering therein from accidents by Fire"[5]. The

Haven Bridge was rebuilt, and the channel through Breydon Water was deepened, but too late to prevent the establishment of the new port of Lowestoft. The port and Haven Commissioners were more permanently established in 1835, although the town had been forced through competition to reduce their tolls.

Over the period from 1800 to the opening of Lowestoft and the "Port of Norwich" in 1833, the pattern of river traffic changed considerably. The keels faced greater competition from wherries, their builders having seen that these could be made considerably larger, and therefore able to carry the larger and heavier cargoes. Roads were improved, and short haul or light cargoes, and passengers, could travel in some cases more efficiently by these means. The greatest challenge of all for sailing barge river traffic was steam - John Thirtle's A View of Thorpe, with Steam Barge working up - Evening[51] reveals the interest and enthusiasm for the new course of propulsive power. The Ipswich Journal of 1813 highlights the response - "the first experiment was tried with the steam packet boat, on which occasion Sir Edmund and Lady Lacon and family with a party of ladies, went in the boat to Breydon, and expressed themselves highly pleased with their excursion. The packet afterwards went through the bridge, amidst the acclamations of thousands of spectators. She has since gone regularly to and from Norwich ...[52].

The 36 keels listed on the 1795 Register did not, however, disappear overnight, as can be seen in John Thirtle and other artists' contemporary paintings and watercolours. The passenger service via barge listed in the Norfolk and Norwich Memorandum book

continued until replaced in 1819 by "The Steam Packet", from the traditional "Old Barge Staithe". Many keels were employed in the trade of carrying timber for building, or bricks from riverside kiln houses and stores to Great Yarmouth and Norwich. The work left to the keels gradually became only heavy and dirty haulage, as lighters.

A contract of 1830 between James Hayn Bessey and his colleague and the Commissioners for Yarmouth harbour for "supplying keels wherries or other vessels for the recovery removing and depositing the Mud Soil or Filth which shall be raised or taken up by the Steam Didelling Engine and Horse Didelling Engine" set "at work in the Haven of Great Yarmouth ... the Steam Engine at the Haven Mouth and in the River upwards of the South gates, with the Horse engine at the Quays between the bridge and the Gas Works and in removing a shoal above the bridge near Cobham Island"[53] - shows a significant use for the old sailing barges in relation to the harbour maintenance. The ballast gained by such means had long been transported by barge. "Didelling" in local parlance was merely to dig or clear out - which meant that the barges had great use in maintaining all the channels and transporting the debris so acquired to points where bank or seawall maintenance could make use of it.

Carrying ballast to lighten ships outside the Yarmouth harbour mouth, or weigh them for passage was a task continued by barges at least up until 1856. But by this time the barges listed by the Collector of Haven Duty, or Water Bailiff, were however nearly all wherries, and other vessels listed include schooners, brigs and cutters[54]. The single unnamed "timber keel" owned by John Clarke, and belonging to Yarmouth, is listed on the 17th of December

carrying 18 tons of sand from the Point (where the continuous Yarmouth harbour dredging and improvements were being worked) - an amount not above the average carried by the wherries also listed.

River barge traffic came into decline following the opening of the Lowestoft navigation and the introduction of steam. In 1844 a new rail link between Norwich and Great Yarmouth undercut the charges made for river carriage, taking more work from the barges, soon followed by a similar price war with new steam transport to Lowestoft. In the 1850's, the newly built larger wherries and navigation cut faced lasting competition from the new form of transport. The sale of "an old established boatbuilders yard ... with a frontage of 91 feet next the river. Also the two cottages, workshops, and other outbuildings, yards and gardens, thereto belonging"[55] in 1850 marks the decline for builders and vessels alike. "Norfolk Railways" sold this off as surplus land, the attached plan of sale plots also showing the sale of a disused boat dyke about the Carrow Bridge (the area earlier known as "Southgates").

The life of the remaining keels was a sad decline, their masts stripped and hulls used as tow lighters, or holed and sunk for use as bank supports for house building in the marshy areas adjoining broads, quay headings or staithe walls.

Part II

A Pictorial Account of Norfolk Keels

Part II

A Pictorial Account of Norfolk Keels

Through an examination of pictures of the eighteenth and nineteenth centuries, one may trace an outline of early Norfolk keels, their hull shape and rig and its variations, numbers compared to other barges, and numbers of crew.

The pictorial evidence demonstrating the shape and form of Norfolk's keels may be broken down into two principal periods:

1. The eighteenth century depictions, consisting of Prospects or Views of Great Yarmouth and of Norwich as the most active ports of the east Norfolk river system, and
2. The nineteenth century paintings, etchings and engravings by James Stark, Stannard, Thirtle, Preston and Ladbrooke.

Norfolk Keels of the Eighteenth Century

The "Prospects" were made by Act of Parliament, in a move to report, depict and detail the towns of Great Britain.

One of the indicators of accuracy in a print or lithograph of the eighteenth century is the degree of realism entailed. For example, many artistic renditions of square rigged ships tend to show as much sail high as possible, with no regard to the wind direction filling these sails as being from the same quarter as that streaming flags on the top of the masts. This situation becomes all the more amusing when the vessel depicted is in a flat calm sea.

When viewing renditions of sailing vessels, one can quickly become aware of the degree of interest in the artist. Recognition of detail accuracy, through comparing drawn images to photographs of present still standing structures such as churches, can signal a higher degree of accuracy when looking at alternate items in the same picture. One must be wary of the degree of artistic licence - an engraving, painting or print will not generally be as accurate as a modern photograph. Angle and lighting can cause a photograph to be misleading even then. There are also styles and traditions in drawing or illustrating. Conventions are adopted from time to time.

In the Prospects, which were originally designed to give an accurate report of a town, I have tended to find quite a high degree of realism. Sails and flags go with the same wind, afloat or ashore, churches, for example, are recognisable when compared to present standing structures[1].

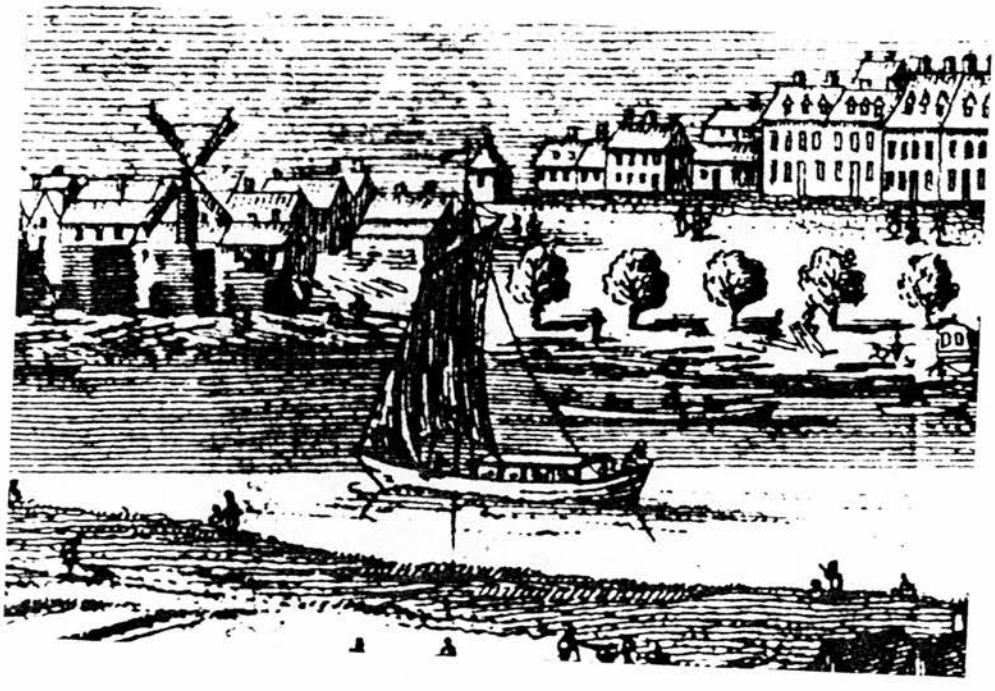
The 1741 South West Prospect of Yarmouth in the County of Norfolk by J Corbridge[2] shows a view over the town, with busy sealanes beyond. The have with boats thereon stretches across the full length of the town and of the picture. Between the town and the waterside is a wide expanse of open area, where figures are shown walking or working at ship building, known as Broad Quay or South Quay. There is a crane at the town waterside near to the centre of the picture, with a ship moored alongside, possibly used for trans-shippping or offloading of heavier cargoes.

There are 28 two- or three-masted seagoing ships shown, moored mid-haven or against Broad Quay, indicating the high level of shipping activity in Great Yarmouth at this time. Of the smaller

craft, there are four which are clearly single masted, square sailed, barges. Several other small non-masted and single masted vessels are also shown, near to and perhaps servicing the seagoing vessels.

Of the small craft which appear to fit the general description of keels, the first of these is a small cameo[3], and shows little detail. This craft is directed upriver of the Haven Bridge, which would be in the area of the opening to Breydon Water at the junction with the River Bure by today's geography. A mast stepped in the forward third of the craft carries a square sail. The boat appears to have less freeboard at the bow than at the stern, the decks lower amidships. A figure in this vessel indicates that this is intended to appear of very small craft dimensions.

A second craft (Plate 7)[4], placed just up river of Haven Bridge, shows greater detail. The mast is again stepped in the forward third of the hull. It carries a large square sail, not fully hoisted, with a pennant flying aloft. A stay leads from the top of the mast to the stern. Lifts appear to run from the masthead to each end of the year carrying the square sail. Before the mast, a triangular foresail is attached to the bow (no bowsprit), hoisted on the stay leading to the masthead. The clew of this sail appears to be fixed to the port side at a point forward of the mast, and a figure stands visible between the foresail and main sail. Bow and stern appear of equal height above water level. The stern in this instance may be rounded, however the side-on view of the artist does not indicate this clearly enough to state such firmly. Inside the hull, between the mast and a small area at the stern, is a raised, roofed passenger area - further figures appear indicated within.



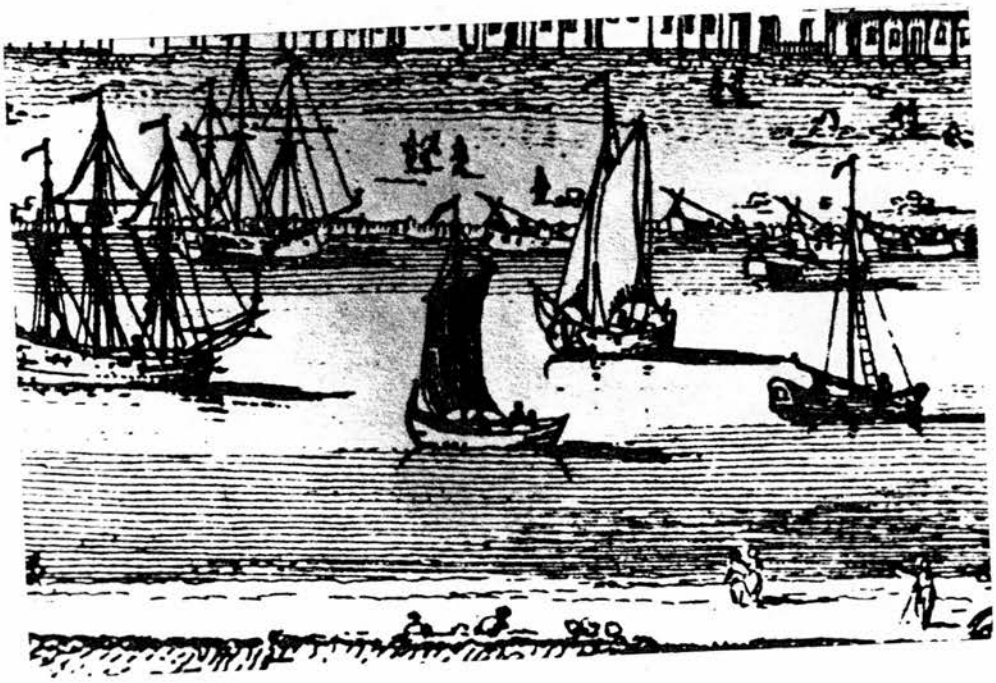
7

At the stern a helmsman mans a tiller, giving this keel a two-man crew. This craft is of a larger scale than the first.

A third small craft of interest (Plate 8)[5] appears in mid river, its dark square sail hangs again from a single mast, but stepped just before amidships in an open hold, with no cabin structures in this side view. In other respects her mainmast and main sail fittings are like the above example, although she carries no foresail. The three persons she carries indicate overall a much smaller size, and the stern appears to be as pointed as the bow, suggesting that this is a doubled ended craft.

A rather different example included in this prospect (Plate 9)[6] appears to the extreme right of the picture, coming in from the open river estuary. Unlike the previous examples, this vessel appears to carry two masts. The main mast carries a large square main sail, with a rectangular top sail. Two stays reach from top of mast to stern, one stay before the mast to a central point forward. Before the main mast is a shorter mast, also carrying a smaller, square sail. There is little further detail to be gathered, apart from lines along the hull which may, or may not, be an indication of the more emphatic lands of clinker built craft.

The two masted example does not fit the general original description of a Norfolk keel, as a single masted square sail barge. It is clearly intended to be seagoing, by its placing in the Prospect - east of the walls of the town of Yarmouth, heading with sail aloft, upriver. This barge type, with extra sail area, may have been used for heavy goods trans-shipment from larger seagoing vessels in the roads when they were too low weighed with cargo to



8

9

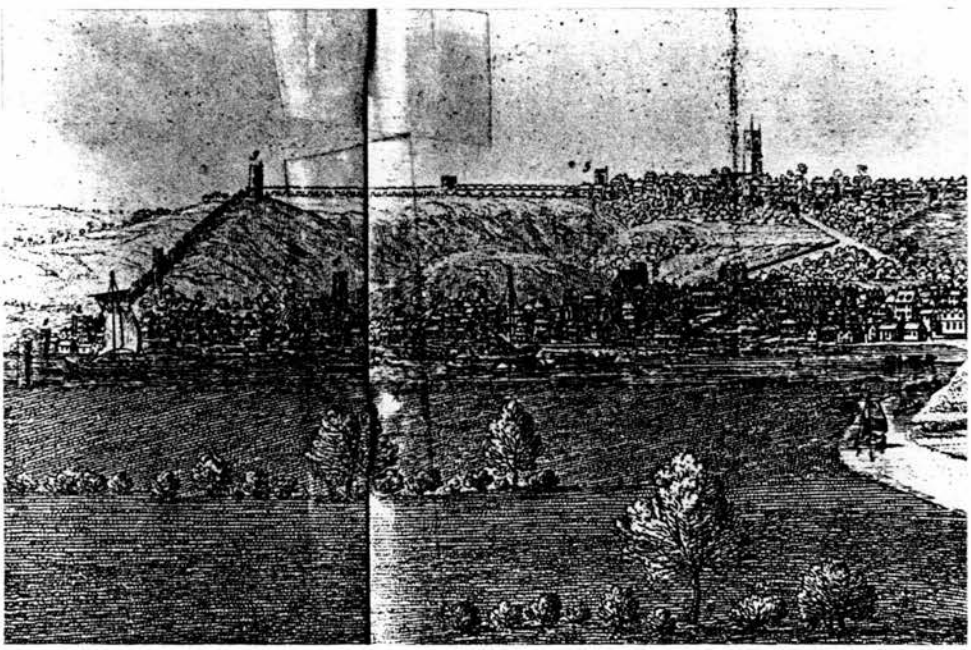
come over the sand bar at the mouth of the Yare. The scale in relation to other vessels pictured in the Prospect suggest that she is of a similar size to those barges pictured upriver.

Further to the seaward, downriver of the two masted vessel, and coursing upriver, is another small craft[7], again possibly used for trans-shipment or hauling ballast. Again a small cameo, this appears to be a single masted vessel, mast stepped amidships, one square sail hoisted. It is comparable in length to height ratio to the second above example. The vessel must have been able to cope with the tides and currents of what is even now a dangerous river mouth for small craft navigation, a seagoing example of the single masted keel type.

The South East Prospect of the City of Norwich, dated 1741[8], shows a wide view of the city overall from the vantage point of a hill. Features of interest are marked by a letter key, notated under the picture, which may illustrate and relate present day Norwich to that of the earlier half of the eighteenth century.

Reading from left to right, or from south west to north east, first is the outer wall of the city, with towers standing to either side of the river, knows as Southgates (part of which still stands today) marking the southern boundary of the town. Towards our vantage point and therefore in the mid foreground, is the River Wensum, before it joins with the River Yare to the east of the city. The Wensum continues to the north marking the eastern boundary of the city and limit of the Prospect picture.

Just within the city boundary, with square sail fully hoisted and heading up river, is a Norfolk keel (Plate 10)[9]. Seen in



10

relation to the size of the Southgate towers, which are in the same plane, this vessel would have been very large. The mast is centrally stepped, stays running from the top of the mast to fore and to aft, and shrouds from masthead to gunwhale. The forward stay appears to be attached to a raised object, which may be a forward winch. The clew of the square sail is tied to stern on the port side, the tack before the mast on the starboard. There appears to be a hatch cover, or covered cargo running from just behind the bow to the point near the stern where the stays are attached. The mast is stepped in the hold. At this point a single standing figure is indicated. The stern appears slightly raked outward, and high in relation to the stem. The vessel appears to sit quite low in the water.

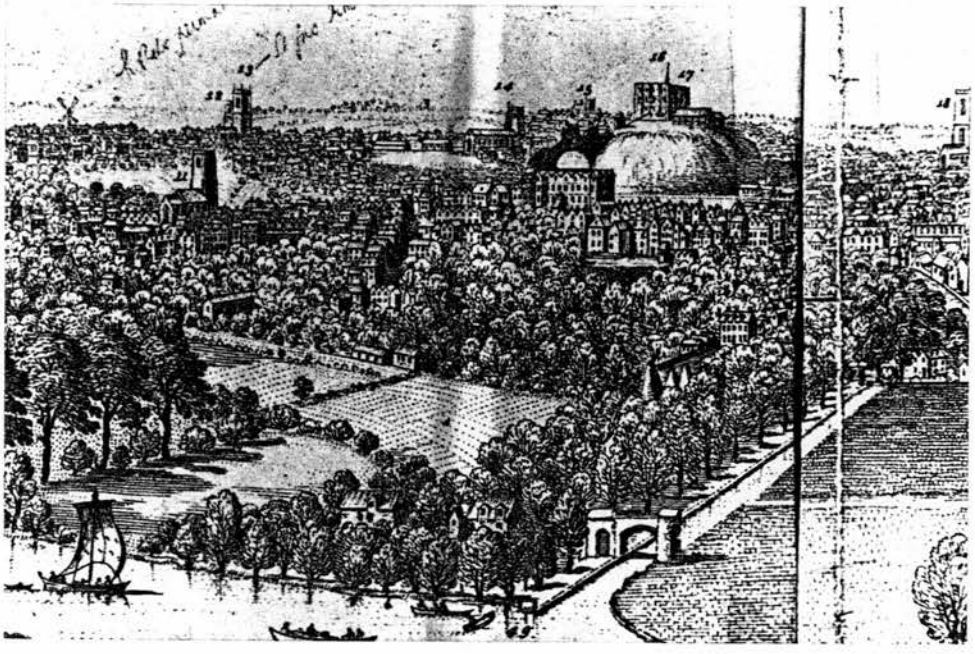
Upriver of this first keel, along what is now called Corporation Quay (which runs parallel with King Street on the western side of the river), a long stretch of water appears to be taken up with moored craft (Plate 10). There are sixteen vessels suggested, including the above. Of the moored vessels, one shows a keel with yard part lowered, central mast standing. Two other vessels have mast fully lowered and laying from stem to stern along the vessel, over hatch covers or cargoes. This is the area in the city for cargo handling, toll duty payment and embarkation in the eighteenth century. Today it is still used by commercial waterborne traffic coming into the city of Norwich.

To the north, the river takes an abrupt turn eastwards. On this stretch another keel[10] is shown with square sail fully hoisted on a mast centrally stepped in a covered hold, heading downstream.

The stern view shows a mast stay running to the stern, the hold filled with cargo. She has a wide transom stern.

Progressing upriver, towards the centre of the picture, a keel is shown with square sail fully hoisted (Plate 11)[11]. In this instance a further detail is added - marks on the sail suggest four sets of reef points, from near the head to near the foot of the sail, by which the sail may be reefed. This vessel carries six figures. The scale suggested is smaller than that of the previous examples. The stern, as in the first example, appears raked back slightly. A raised area on the tip of the stern suggests the topmost part of a rudder.

The central area of this Prospect shows a detail not indicated on modern maps - a straight water channel extending from the river towards the centre of the city. At the entrance to this is the key number 49, indicating that "Sandlings Ferry over the River Wensum" work from this point. Two small rowing craft are shown on the river near to the entrance. Also near to the entrance to the channel is a building with a round tower to the right, archway over the channel, and square building with high gateway to the left. This building, or one which contains elements of such earlier structures, can still be seen in Norwich. There is still a slight shallow inset from the river, but beyond the building there is now a road leading up to the precincts of the city cathedral. The inlet shown in the Prospect ends at the point where water meadows end and buildings begin. It is possible that this was constructed to allow water carriage of heavy materials (for example, building stone) to the cathedral itself, or to the market place now called "Tombland" which is just



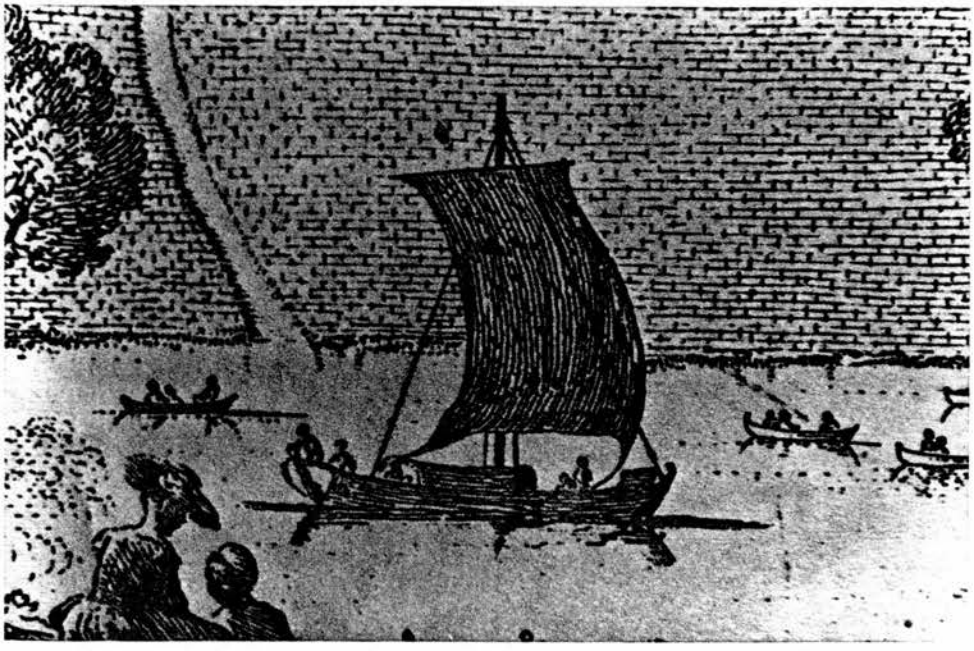
11

beyond the cathedral precinct boundaries, towards the centre of the city. In the eighteenth century, it may well have provided a convenient route for keels unloading for the city market[12].

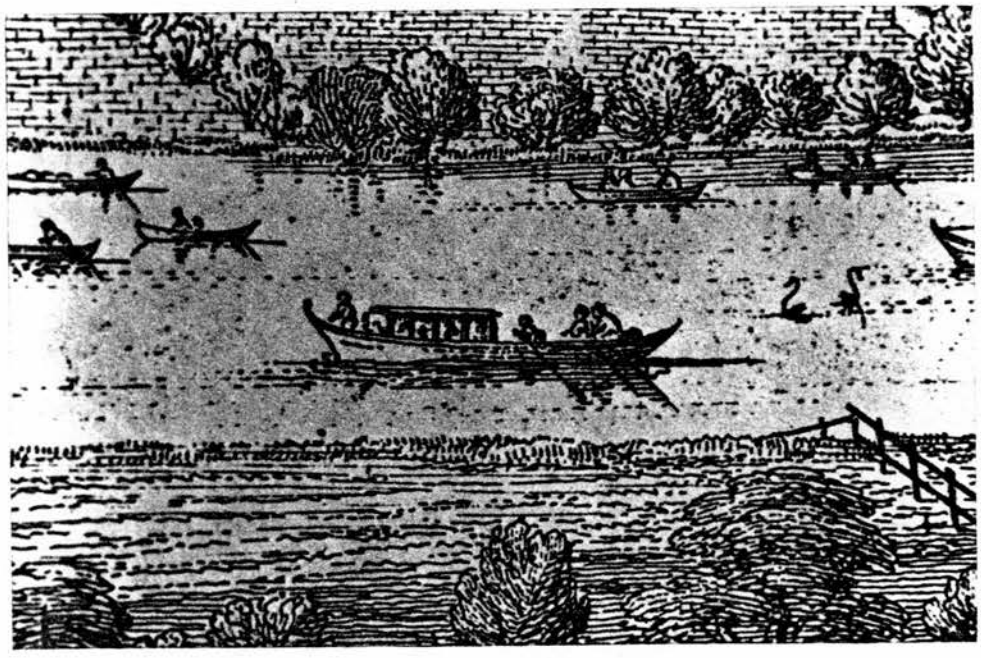
To the right of centre of the picture another keel is shown sailing upriver (Plate 12)[13]. This vessel, with centrally stepped mast and square sail fully hoisted, shows five sets of reef points evenly spaced from head to foot of the sail. Stays run from masthead to what appears to be a winch at the bow, and to a little behind a hatch cover or covered cargo towards the stern. A small cabin structure is indicated forward. She clearly has a transom stern, with rudder post extending slightly above the flat width of the stern. There appear to be three crew men, including the man at the tiller.

To the right of the fourth keel in sail, upriver, a rowed passenger boat (Plate 13)[14], with covered area, heads towards the Bishop's Gate and Bridge. Many small rowing boats appear along the river in this Prospect. However, this larger example does appear to be nearly two thirds the length of the keel previously described. Although local passenger services may have been accommodated by such craft, the means of propulsion would not have competed with the sail of longer-distance keel passenger service. Three rowers, with a fourth member at the tiller, appear to propel this long, seemingly lightly built craft. The general image is similar to that of the eighteenth century rowed London passenger wherries.

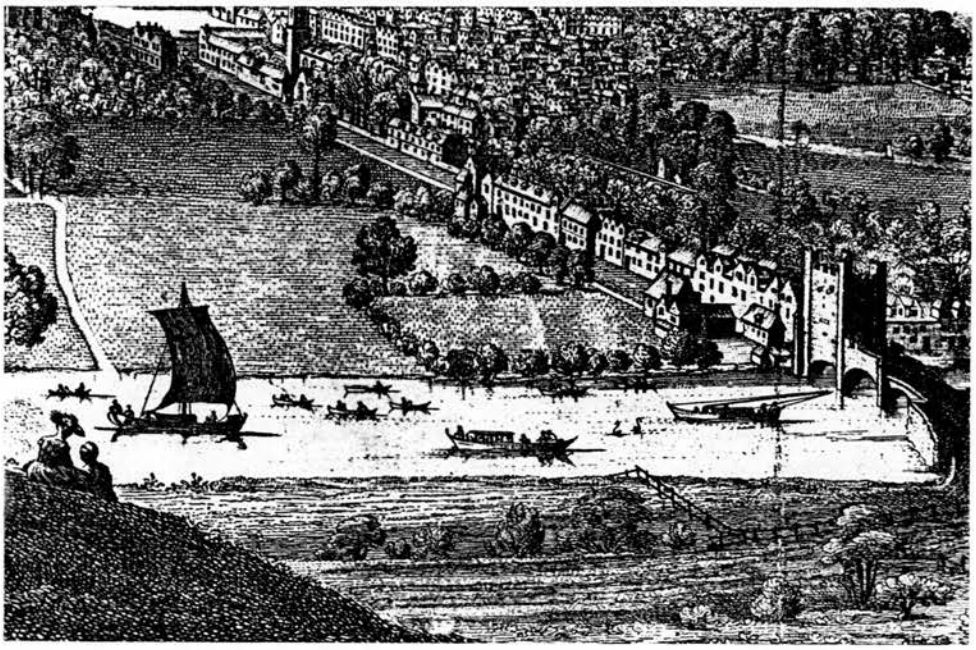
Downriver of Bishop's Bridge, a barge with forward stepped mast fully lowered leaves the archway spanning the river (Plate 14)[15]. The mast is lowered towards the stern. The stays attached



12



13



14

to the top of the mast remain attached towards the stem and stern. The foot of the mast appears to rest loosely on top of a covered hatch. A block support for the mast is suggested midway along the length of the hatch, but there is no indication of a tabernacle. Two figures at the stem appear to be concerned with a block attached to the rigging at this point.

Beyond Bishop's Bridge appears a keel with sail full, again with five reef points on the sail, and a cargo filled open hold (Plate 15)[16]. In this instance, the hull appears double ended. The mast is stepped amidships. Two smaller keels work further upriver. Beyond Cow Tower, which may still be seen today, the river bends westwards, where further distant keels may be seen in the Prospect, working their way upriver to the uppermost point of navigation on the Wensum or upper Yare, at New Mills.

This Prospect shows many images of keels. The variation of format is not as great as that shown in the Great Yarmouth Prospects. The Prospect does indicate how important the keel were to the commerce of Norwich. All of the sailing vessels shown are keels, and these are given a "pride of place" in the artistic composition of the picture. The first keel discussed emphasises the Southgates as most emphatically a gateway to the city of Norwich. Upriver the keels play out a demonstration of the techniques of handling a river system with low bridges, at the same time as drawing the eye to the rather elegant Bishop's Bridge of the time (Plate 14).

The West Prospect of the Town of Great Yarmouth by J Corbridge 1742 shows further detail of inland waterway traffic to the earlier Prospect from the South West[17].

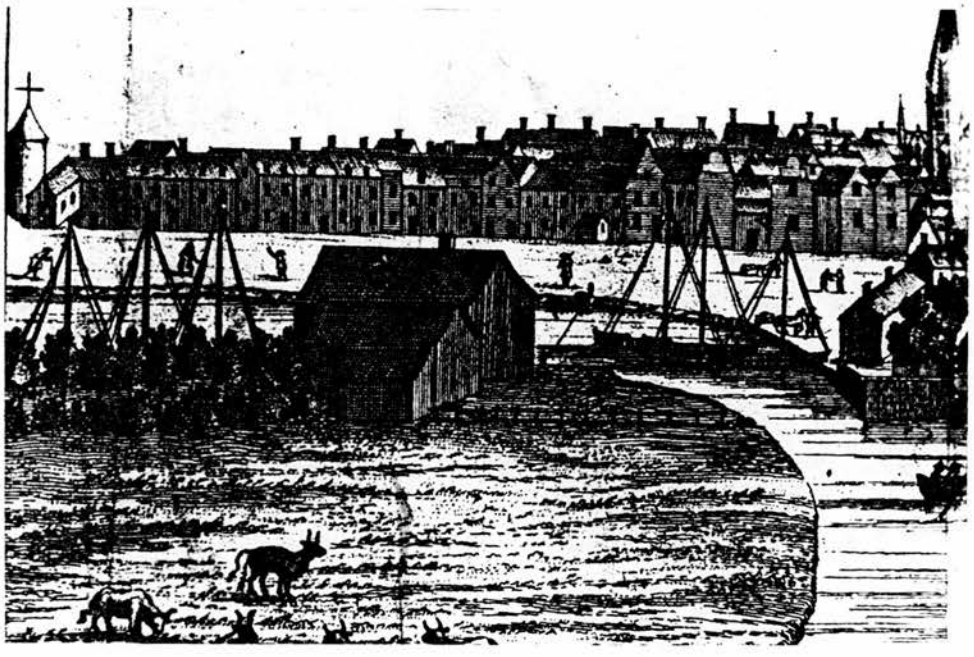
15

This Prospect shows a near view of the north west access to the port town, from a viewpoint near to Breydon Water. Both the Bure access (which feeds from the north Broads area) and the Yare access (which feeds from Norwich to the west) are shown, with traffic thereon. The town itself forms the backdrop to the river scenes. The foreground (to the east) shows farming activities in fields through which a road passes before joining the wooden-built Haven Bridge which could be opened for high masted water traffic, to communicate with Great Yarmouth itself.

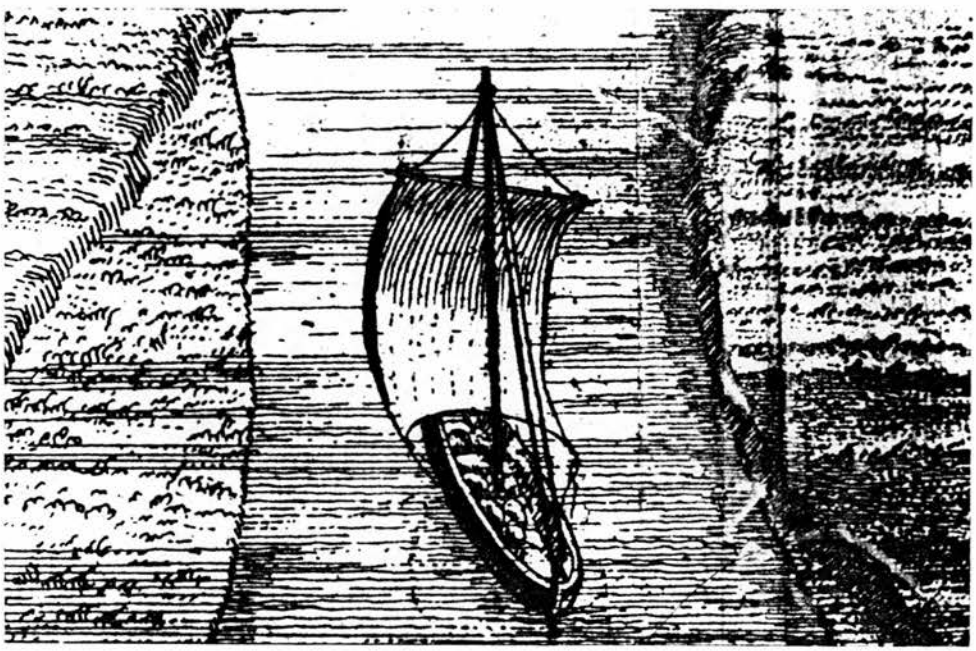
To the left of the picture, upriver of the Haven Bridge, there are several inland waterway craft shown, with one seagoing ship pictured moored on the east bank of the river. Below Haven Bridge are fifteen moored seagoing vessels, with only one single masted barge, this is full sail upriver.

Reading from left to right, the first group of six moored vessels are on the River Bure before it meets with Breydon Water (Plate 16)[18]. These are all single masted. On each, twin stays run from the masthead to fore and aft. Of the three vessels visible to water level, all appear to be bow to the bank, the foremost showing it above over the line of the bank. The stern of each is straight, however this side-on view does not indicate hull shape at the stern.

On the Yare route through Breydon Water is a single keel in sail (Plate 17)[19]. This vessel is clearly double ended, with no transom. The mast is centrally stepped, stays running from masthead to fore and aft. The square sail is supported by lifts from mast top to yard, the tack and clew attached amidships port and



16



17

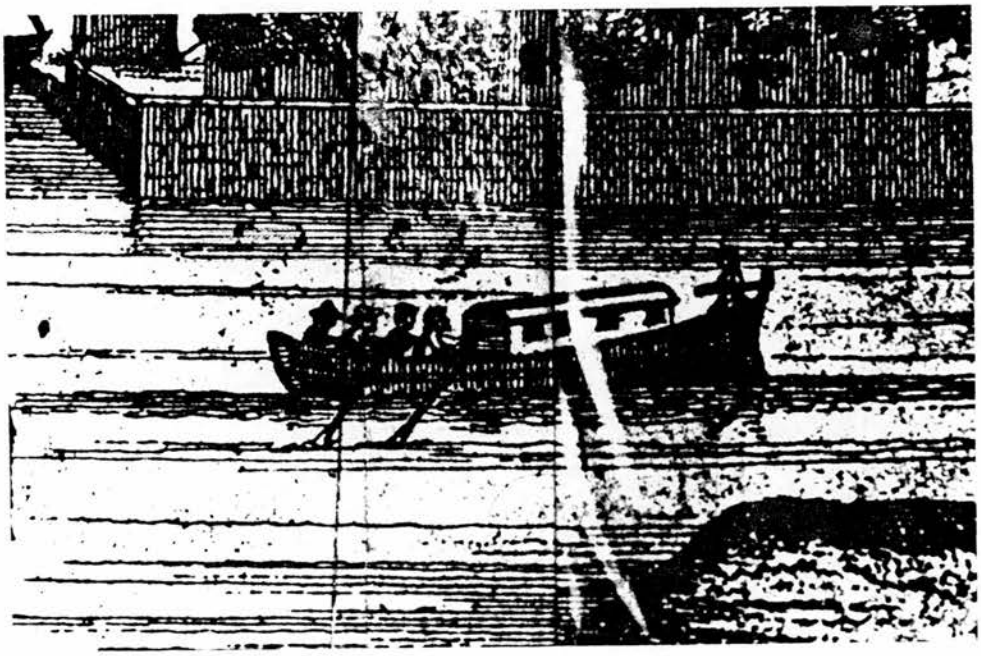
starboard. The vessel appears to contain cargo, but there is no figure to indicate scale.

A rowed passenger boat, with three pairs of rowers at the fore, makes it way into the turn to the Bure (Plate 18)[20]. There is a single figure at the tiller, which seems to be attached to a large rudder for the size of the hull. There is a covered area, suggesting a small passenger boat very similar to that shown in the South East Prospect of the City of Norwich. Another such craft is moored mid river near to the Haven Bridge.

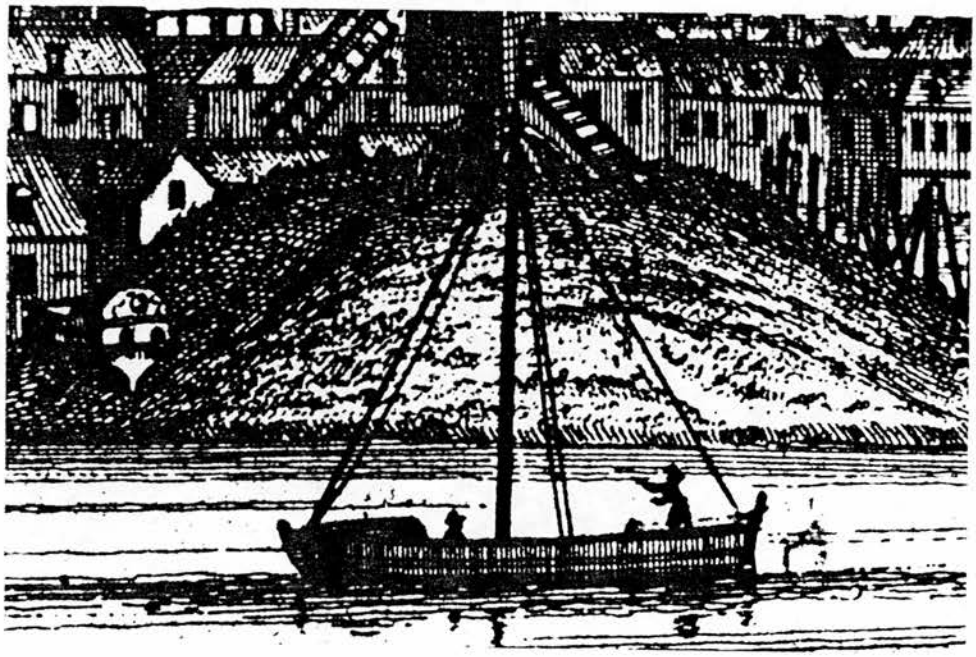
A keel moored mid river in the turn towards Haven Bridge appears to have a cabin forward of an open hold (Plate 19)[21]. The mast is again centrally stepped with twin stays to fore and aft. The stern appears to be straight. There are two figures on board suggesting a scale of hull length of 33+ feet. The scale is similar to that of the two rowed passenger boats.

A North West View of the Quay of Great Yarmouth by J Butcher (1790)[22] is not a "Prospect", in that it does not try to give us an image of the town overall. It is, however, concerned to portray an important area of the town of Great Yarmouth, and as such, places a keel emphatically in a position of importance in the picture.

The background to the View is the northward river frontage to the town of Great Yarmouth and Broad Quay. In the centre, a more modern Haven Bridge than those seen in earlier Prospects conceals the hulls but not the masts of several large seagoing ships including a busy seaward haven. Two small transom-sterned rowing boats and three seagoing ships also appear before the bridge. In the left foreground, a foreward masted barge with gaff sail lowered



18

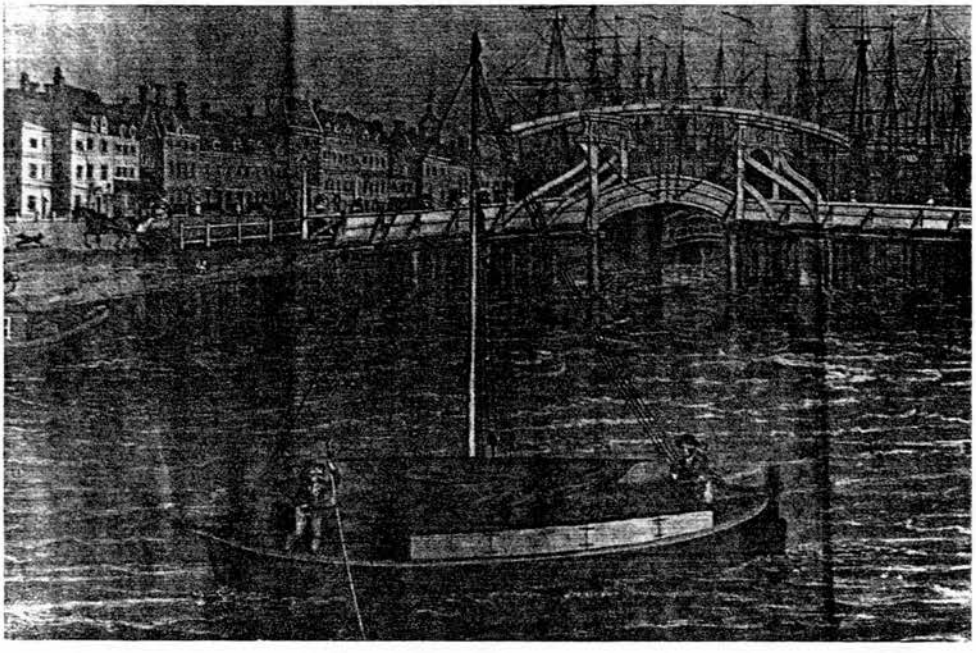


19

is apparently fitted for residential or passenger accommodation, having square, framed windows on a large cabin which takes up the full length of the hold area. She has a forward, stern, and side decks, and a beak at the bow where she is moored into the quay.

In the centre foreground to the View in pride of place is a keel (Plate 20)[23]. She has a centrally stepped mast. From a winch on the fore deck a forestay leads to the masthead. There are four blocks to the lower end of this stay, which is clearly used when hoisting and lowering the mast. A double whip halyard runs from the masthead to the centre of the yard. A luff tackle runs from the masthead to a second winch on the after deck, just behind the coaming which surrounds the hold. At the bow, there is a short beak. A man appears standing on a side deck, using a quant. At the stern, a second figure stands using the rear winch. Behind this second man, a long tiller extends, with its hole over the top post of a large rudder. The post stands quite high above the tiller, and leads down to a quite rounded top rudder shape. The vessel appears to have a broad stern, possibly a transom.

A second boat to the right of the keel is dissimilar in many ways (Plate 21)[24]. The mast is stepped in the forward third of the hull, behind a short foredeck. There is no beam extension from the bow. The spar resting on top of a covered hold extends at right angles to the mast, a gaff jaw at the end of the spar meeting the mast above a series of rings - typical of the gaff rig of Norfolk wherries. There are no winches either on the foredeck or at the foot of the mast. A single stay with tackle runs from the foredeck to the masthead, a halyard running down to the gaff. A single



20

21

figure also quants this vessel. His companion holds the tiller at the stern. The rudder of this vessel is unlike that of the first - the tiller extends through a very square top post to the rudder; the rudder appears very square in shape. The vessel appears to be double ended.

The last two barges described in the View, described in the last decade of the eighteenth century, are perhaps representing the two main contenders for the position of Norfolk's principal inland sailing craft in the following century. In the economic competition of survival of the fittest, they appear to be even. The boats portrayed appear to mirror each other in terms of activity displayed. The artist suggests quite similar size craft, with similar functions and use.

Overall, the earlier eighteenth century Prospects describe a boat form that was in very general and varied use around East Anglia. These boats were capable of both inland and seagoing trade. Owners building keels with an additional foremast, carrying a square sail as seen in the 1741 South West Prospect of Yarmouth in the County of Norfolk no doubt had either a large size, great cargo weight, or competitive speed to consider.

Norfolk Keels of the Nineteenth Century

John Thirtle (1777-1839), a Norfolk artist of the Norwich School, was one of England's better watercolour artists of the early nineteenth century. His period of work between 1805 and 1830 demonstrates a love of Norfolk scenery which includes many images of

sailing barges on the east river system.

Although some of Thirtle's paintings have titles describing boats as "wherries", this may not be appropriate in some instances. As has been demonstrated in the eighteenth century Prospects or Views, Norfolk inland vessels varied a great deal. Lack of research on inland craft of East Anglia has generally led these all to be popularly called "wherries". In deciding whether to accept titles of pictures as being appropriate to their content, one must remember that although some may have received their title from the artist, others carry titles ascribed by owners of the paintings, given at any point since their first sale. Some may have titles ascribed by the cataloguer, Marjorie Allthorpe-Guyton, on drawing together the publication on the Norfolk Museum Service's fine collection (169) of Thirtle pictures[25]. However, some do appear to have a similar format to the late nineteenth century or late Victorian floating wherries, and may therefore be safely called by that name.

Thirtle was interested in a romantic presentation of Norfolk waterways, the effects of colour, light, and water - the atmosphere of humid Norfolk comes across well in his paintings. The preoccupation with this style does not, however, interrupt a search for boat detail. The Devil's Tower and Carrow Bridge[26] is presently undated but similar in presentation to others which were first exhibited in 1829. The background of the picture gives a view of the eastern egress of the Yare from the city of Norwich. Outlines of buildings and of vessels are softened by colour and shade, giving a slightly out of focus appearance. In the foreground, detail stands out more sharply, and here, to the right of the picture, one

finds two clinker barges. One presents her pointed stern while the other lying alongside to our left shows her bow.

The first boat in the Devil's Tower scene shows a quite square rudder, with tiller attached over the top of the stern post. Slightly further forward is what appears to be a cabin structure - this does not extend the full width of the boat, allowing side deck space around it. There is a small hatch access to the rear of the cabin. On the cabin roof is a small smoking chimney. A halyard with blocks leads from the masthead almost straight down to a part lowered spar with sail furled, also a lift well towards the end of the yard. The yard rests with its upper end towards the port side and away from the bank. The vessel is of the gaff rigged or wherry type, with a forward stepped mast, lines suggesting lands indicating that she is clinker built, with covered hold and cabin to the stern.

The second barge in the Devil's Tower scene shows us only her bow and a short area forward. The bow is very bluff, and the vessel appears overall to be very beamy. There is an upright triangular fixed stem-head fitting or horse leading forward and above the beaked stem post, from which leads stay with blocks, leading back towards the stern. Just behind this upright is a winch, placed centrally on the forward deck. The deck ends at a cabin structure, again with chimney. Towards the starboard side, at the rear end of the cabin, a figure appears to be engaged in reaching into a small hatch cover to the cabin. Beyond the cabin is an open hold. The mast is not visible, but the positioning of the forward stay would suggest that the mast is lowered to the stern - the bridge in the background of the picture affording a further basis for such an

assumption as barges passing this point would need to lower their masts to go under it. This second barge is a Norfolk keel, which commonly appear with cabin forward of an open hold, mast winch on the forward deck, halyard winch on the rear deck. The Devil's Tower and Carrow Bridge shows both keel and wherry, or square and gaff rigged type, moored together at the busy Norwich waterside.

The two barge types commonly appear together in the river scenes: Thorpe Watering (also undated)[27] shows a transom stern barge with mast lowered over open hold and a gaff rig barge with sail lowered moored alongside each other, bows to the bank, Lines on the foremost barge suggest that she is clinker built. The scene here is reminiscent of John Constable's famous Dedham Vale paintings. Two horses stand dejectedly in the traps of a cart which is backed up towards a barge, neither animal "watering". The "watering" activity appear to be the transferral of goods from the former transport to the latter. In the distance are three further boat outlines, the last of which appears to carry a large square sail. The setting to this picture suggests a common usage for the inland boats in more rural Norfolk - the horse and cart stand on ground in shallow water. A fence towards the river would appear to outline the safe extent of shallow standing. A wide track leads from a riverside road to the hard standing. It appears a very convenient arrangement for transfer of goods between horse and wind-powered transport. Thorpe, to the south east of the city of Norwich, on the Yare would have provided a convenient loading point outside the busier city Corporation Quay for arable goods or livestock not intended for the central Norwich market.

Although there are no pictures in the Thirtle collection with "Norfolk keel" in the title, this is no bar to the artists' contemporary vision of such as an integral part of many river scenes. Thorpe Staithe[28] places a keel very much in the forefront to the onlooker's eye. In this there are again several wherries moored near the river bank; however, another vessel, with mast lowered towards the stern, passes them by. She has a forward cabin, centrally placed winch on her forward deck, and very loaded open hold area. The keel, with a single figure on board, takes pride as the main feature of activity in the composition.

View on the River near Cow's Tower, Norwich[29], dated to 1810, shows a clearly clinker-built vessel, lines marking the lands of the clinker overlap, double ended. Her small cabin with starboard hatch opening is forward of an open hold. Stays lead from a forward winch to the top of a lowered mast, which appears to be centrally stepped. A single figure stands at the rear winch of what is evidently a large vessel, a partner handles a quant on the port bow, seemingly fending the boat off from the river bank. At this point on the Wensum, the barge would be between two low bridges, suggesting that larger vessels of this period did not use sail if possible until reaching the more open water of the Yare.

Rainbow Effect, on the River, King Street, Norwich[30] shows a variety of sailing barges tied up at this main city loading point. Seven raised masts on the west bank indicate a busy riverside. The two vessels in the foreground are moored nose to tail. Both have masts stepped in large tabernacles, well forward, covered hatches, and gaff sail furled around gaff hanging or laid along the hatches.

The strakes of the first lead from a slim bow, broadening amidships. The second shows a bluff stern with rudder. These hull shapes and fixtures indicate the more recognised style of double ended wherry. Towards the east bank of the river, another barge is guided by a single figure holding a quant. The mast is lowered along a covered hold, the mast foot in a large forward tabernacle. As her fellows in this picture, she appears to be a clinker-built wherry, but unlike her fellows she has a small transom stern.

The Two Masted Barges

A two-masted boat seen in the 1741 Prospect of Yarmouth suggests that Norfolk boatmen had allowed themselves to utilise an extra mast and sail, even with top sail, for some time.

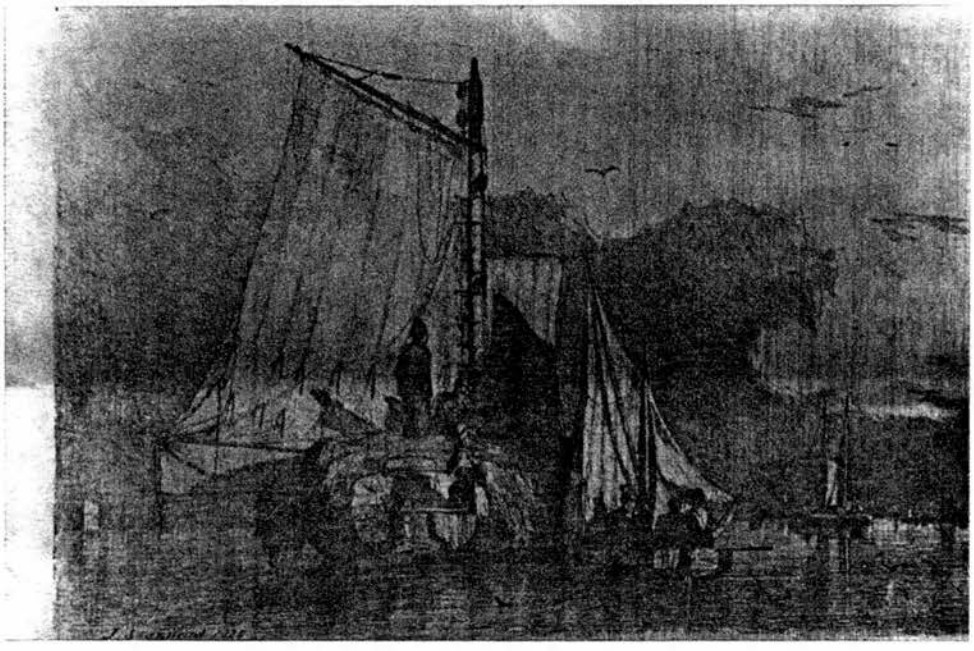
One of the earlier of Thirtle's paintings, Boat Builder's Yard, near the Cow's Tower, Norwich[31] of 1812, presents a further problem of definition between nineteenth century barge types. The largest of these is a clinker-built wherry hull, drawn up onto a flat area abutting the river[32]. In the centre of the picture, before the Cow Tower, another vessel appears coming into the bank with all sail hoisted. She carries two masts, each carrying a square sail. Little rigging shows - one brace on each end of the yard of the main mast, trailing down; one brace is shown on the mizzen yard. The mizzen is sheeted to an outrigger which carries its single block. The emphatic lines on the hull suggest this is also clinker-built.

The two masted craft described may be a small keel carrying an

extra temporary mast for a bridge sail. If this is the case, Thirtle is using artistic licence in order to present a type - a small temporary mast and bridge sail is used to save the trouble of constantly lowering and raising a mainmast between bridges, and at this point between close bridges on the Wensum it would be ever more troublesome to raise the two masts described. Alternately, Thirtle is running fairly true to form as a quite observant and accurate recorder of images - the tower, which also appears in other examples, is fairly presented. If so, he is presenting a variation of the single masted barge types.

John Stannard (1797-1830), like James Thirtle, was an artist of the Norwich School. Although again concerned with Norfolk scenes, his pictures contain more clarity of detail, being presented in a less impressionistic style. Boats on Breydon by Stannard of 1825 (Plate 22)[33] presents us with a fine image of the "mystery lady" in what is otherwise an examination of single masted vessels, the two masted sailing barge of Norfolk.

This painting has little background detail, the setting being the open stretch of water upriver of the Haven Bridge at Great Yarmouth. Two vessels make up the main portrait, a third a little way into the distance, others showing sail in the far distance (these last affording little further detail). The principal subject is a transom sterned, clinker-built barge. She bears a great sense of heavy build, weight, and slow motion. She is loaded down with reed or thatch, on top of which are two figures. As one of these sits, his fellow stands gazing to the distance, his hands in his pockets, thus emphasising the sensation of little to do and all day



22

to do it in. They are accompanied by a lady who stands by the tiller, her attention however diverted by a smaller boat apparently caught in the lee manoeuvring alongside. The small craft, carrying three seated figures, appears to be a transom-sterned dinghy. Its single sprit sail (a small spar is set diagonally from the lower end of the mast to the top outer corner of the sail) has little wind.

The lack of activity aboard the vessel does little to interfere with her seemingly comfortable motion. A large gaff sail is hoisted on the main, centrally stepped, mast. The vessel has a combined peak and throat halyard of the kind found on later Norfolk wherries[34]. Hoops running down the mast tie in the near part of the gaff sail. There are ties on the lower part of this main sail for reefing in, and a reef pendant rove through cringles on the leach of the sail. The line end hangs loose, but a further line runs from the outer foot in board towards the stern. With line cleated or tied in she apparently needs little attention.

Before the main mast with gaff is a second. Details of the second mast are obscured by the gaff sail, but she is clearly carrying a square sail. Lines lead from the starboard yard end back to the stern. Where Thirtle described a keel with an extra lug sail and mast, Stannard presents a transom stern wherry in similar guise. This vessel, appearing as this does on an open stretch of water, is unlikely to have a second mast and sail raised to act as a "bridge sail". She is clearly utilising full canvas. Extra sail area produced in this fashion may be a device for gaining greater power for heavy loads.

Fort and Mouth of the Yare of 1819[35] by I Preston shows

perhaps the intermediate position of the two masted barge vessel in the early part of the nineteenth century. This view contains seven large two-masted seagoing ships, either moored, in the sea lanes beyond the river mouth, or progressing from the river mouth. In the left foreground are four vessels of much smaller scale, evidently local barges active around the point of the estuary[36]. Of these, two are single-masted with gaff rig, one is single-masted and moored, the fourth carries two masts. One of these masts carries a gaff sail, and is perhaps a two-masted wherry. The two-masted barge described is of a similar scale to the single-masted, and works alongside them. This would suggest a common place in purpose if not in form with the single-masted barges of Norfolk.

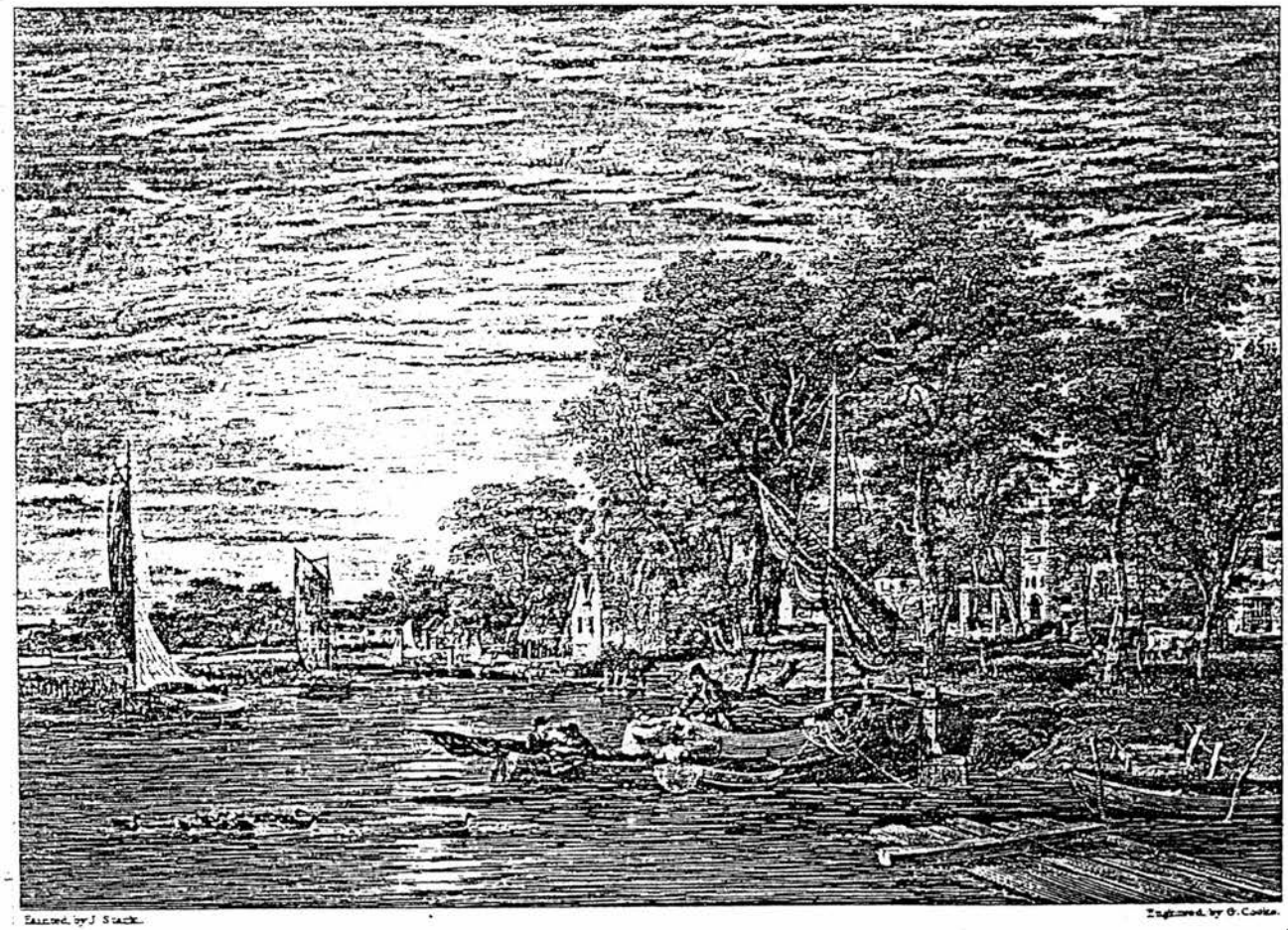
The Passing of the Keels

John Thirtle's paintings tell us that single masted keels and wherries of both pointed and transom sterned type were active from the turn of the nineteenth century to the 1830s. From this time the barges become less apparent in numbers in the context of scenes in the city of Norwich, which had been a focal point of call from the early eighteenth century.

James Stark (1794-1859), as a painter of the Norwich School, illustrated in 1834 The Scenery of the Rivers of Norfolk, dedicated "To His Most Excellent Majesty, William the Fourth, King"[37]. It contains various engravings of vessels from paintings by Stark between the period 1828 and 1833. These afford a view of change in the predominant boat form seen on the Yare, Bure and Waveney.

View on the Yare, near Thorpe Church (Plate 23)[38] identifies the square sail transom-sterned type with rural activities. As in Thirtle's Thorpe Watering, a road runs parallel to the river, and there are facilities along the waterside for reaching craft moored there - at this latter date, however, there appear to be a greater number of small jetties rather than shallow hard standing for carts. Tow gaff-rigged, covered hatch, broad-beamed wherries make way up river to the left. Moored to the right is a transom-sterned keel. She is loaded down with timber in her open hold area. A single figure standing on the gunwhale walkway on board passes a dog over to a man in a small boat which contains a further two passengers. The rig is very similar to that seen in Thirtle's View on the River near Cow's Tower, Norwich, a winch on the port side of the stern deck before the tiller, large square shaped rudder, and very beamy lines. In this case the mast is raised, but the yard part lowered with the sail reefed in. Twin shrouds for the mast run down to either side.

Harrison's Wharf King Street, Norwich (Plate 24)[30] again shows a timber-laden keel from a stern viewpoint. In general detail she is very similar to the above keel seen near Thorpe church, but has square sail fully hoisted. She has three figures on board - the master or bully sitting on the tiller to guide her. Harrison's Wharf, on the river mooring along King Street, does not appear as active as in the eighteenth century, or in the earlier nineteenth century as seen by John Thirtle in The Devil's Tower and Carrow Bridge. Only three other barges appear on quite a long reach of Riverside. The first of these makes towards us from the distance,

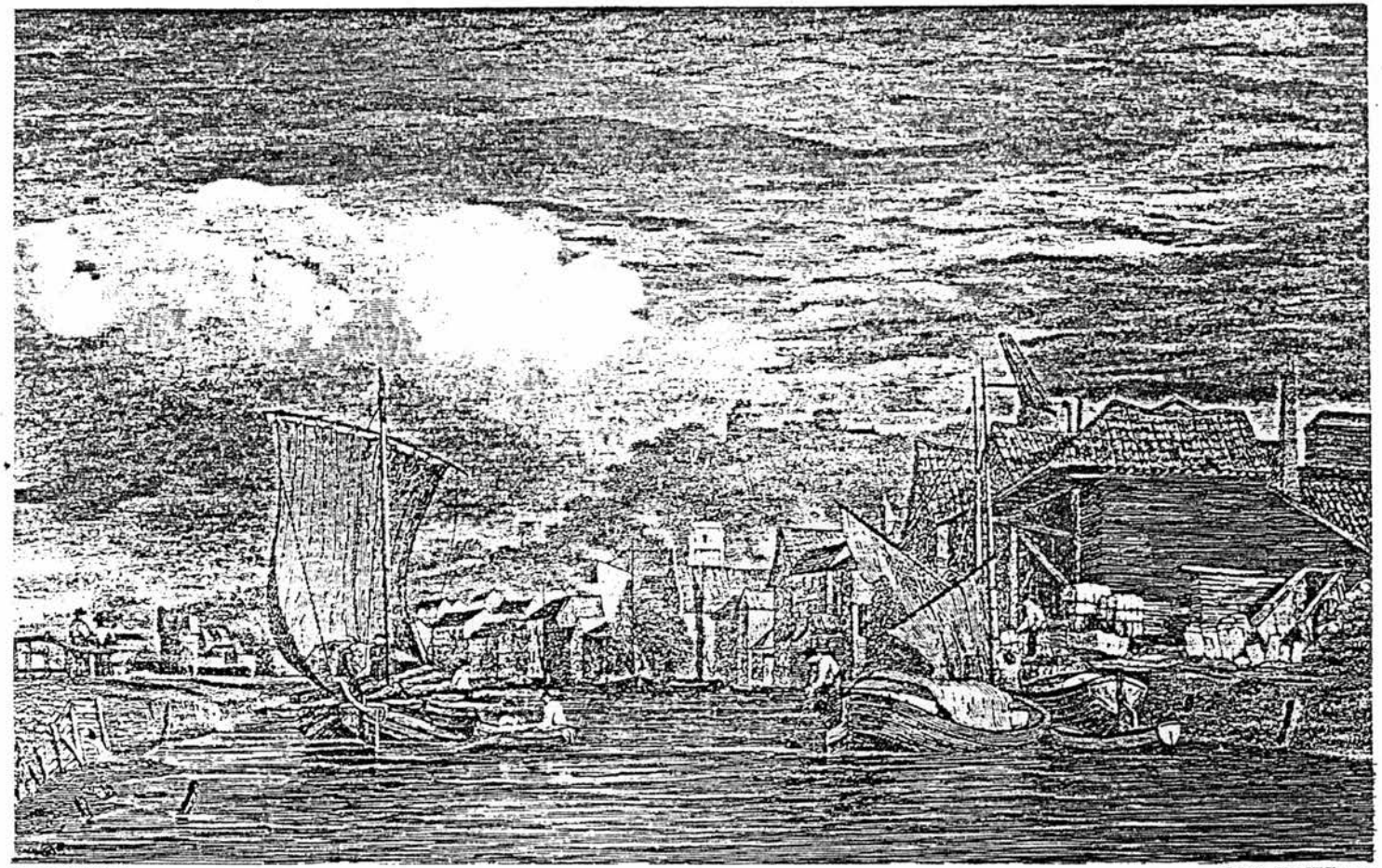


Painted by J. Stark. Engraved by G. Cooke.

VIEW ON THE WENSUM, NEAR THORPE CHURCH.

Printed by S. E. Hawkins.

Published by Moon, Boys & Graves 6 Pall Mall London & James Stark Norwich 1823



Painted by J. Stark.

Engraved by J.H. Kennett.

HARRISON'S WHARF KING STREET, NORWICH.

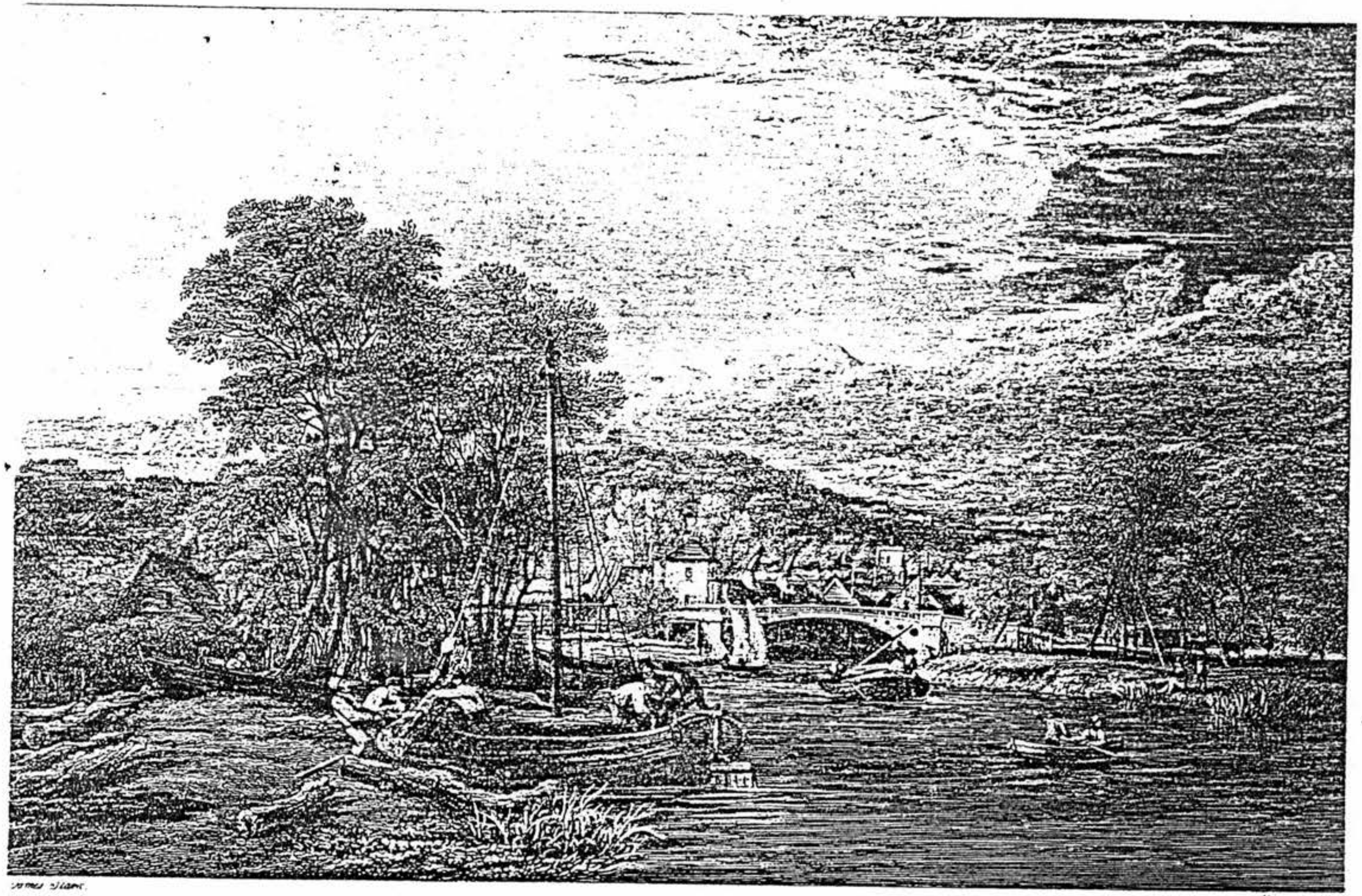
Drawn by J.H. Kennett.

Published Sept.1 1829, by Moon Boys & Graves London, & by James Stark Norwich.

gaff sail full hoisted in the lee of the riverside buildings. Another, with pointed stern, is occupied by a single figure who is drawing water on a rope with a bucket. Behind him the hatch is covered, with the partially lowered sail laid over it. On the inner side of this vessel another transom-sterned boat is apparently being unloaded, hatch covers slid back whilst two figures handle bales of cotton or cloth onto a quay. What little can be seen of this last vessel's rig suggests that it is also gaff rigged.

Carrow Bridge (Plate 25)[40] shows a round-topped transom stern, central masted keel being loaded with timber downriver of the city. Six men are involved with stacking timber on board as she sits bow into the low river bank. Rig and placing of feature are similar to other above examples, a smaller additional visible feature being a pair of blocks on the lower end of a forestay, possibly a stay-fall tackle for lowering the mast. Forward details are again obscured from view. Stark's Carrow Abbey[41], describing a boat builder's yard on the south side of the city, shows a transom-sterned wherry in process of being built, suggesting that this stern shape was more popular than the pointed stern in the first half of the nineteenth century.

An oil painting (untitled) by Ladbrooke of the Norwich School (Plate 26)[42] dated to the 1830s, presents an alternative cameo of the keel's situation. In the Ladbrooke keel picture, the vessel in question steers away from the viewer along a quiet stretch of river, possibly near to Whitlingham on the Yare (which river as yet unknown - further research may identify this by a single building to be seen in the background). A single figure guides her, standing at



CARROW BRIDGE.

(NORWICH.)

London, Dec[illegible] Published by Moon, Boys & Graves, 6 Pall Mall.

26

the tiller in front of her transom stern, to which a small row boat is tied. From the masthead the halyard with blocks leads back to the tillerman (he obscures the area where one would expect to find a winch in other examples). Braces run from either end of the yard to points on the side decks. A second figure stands amongst great lengths of timber laid across the hold. The sail rises to over six times the height of the figure at the stern - suggesting a possible mast height of over 36 feet.

Away from domestic activities, the keels cease to be popular subjects. Mutford Bridge[43] shows many inland sail boats at a regatta. None of these shows a square sail rig. The gaff-rigged vessel in the foreground, called Rob Roy is a transom-sterned wherry. She is loaded with well dressed passengers arranged around a covered hatch on which some sit - an early indication of the wherries' future as pleasure boats. Shipmeadow Lock[44] of 1831 also shows a transom-sterned wherry on the Waveney, where smaller barges were still an important means of communication. Stark's Mouth of the Yare[45] of 1828 shows several barges engaged in the clearing of material from the south bank of the haven mouth. A transom-sterned wherry is moored next to a lone square sailed keel, by no means a primary feature of the composition. Two further gaff-rigged vessels show mast and sail around the point.

Thirtle's A View of Thorpe, with Steam Barge working up - Evening of 1815[46] reveals the more advanced forms of propulsion beginning to compete with sail in the early part of the nineteenth century, and which marked their passing. The vessel concerned does not, however, appear to be propelled by steam in the moment captured

- she carries two masts, both bearing lug sails fully hoisted. Her lines sheer upwards more sharply than the smooth lined, beamy, keels or wherries of other pictures, and the overall impression is one of a speedier craft altogether. She has a high-covered hatch area, and unlike the purely sail vessels described, also a guard rail running around her forward deck.

Steam powered boats were used from the mid-nineteenth century for more urgent transportation, such as the ice wherries developed in complement to an upsurge in the Lowestoft fishing industry[47]. Stark's 1831 Yarmouth Regatta[48] indicates the future for the keels. There are no square-rigged vessels, but many transom-sterned gaff rigged craft. Yarmouth Regatta gives pride of place to a steam boat with high stacked chimney, and no sail facilities. There is an air of general frivolity, with top-hatted figures waving and flags flying. Many of these inland sailing boats survived into the Victorian age only through interest in sport and recreation.

The Traditional Norfolk Keel and its Variations

In the eighteenth century Prospects, the wide variety of small vessels shown on all pictures suggest the defining factors of the Norfolk barge or keel genre. Mast position, bow shape, stern shape, size, number of masts, number and type of sails, appear in many combinations. A keel may be defined by its hull shape, by its rig, or by its area of working, or simply by popular use of the term. The inland boats in the genre of "keel" appear most generally with square main sail on centrally-stepped mast in open hold.

The most common form seen in early eighteenth century Prospects is with open hold, with central stepped mast, and transom stern hull. The masts of each appear to have fore and aft mast stays. Those seen with sterns that in profile appear to be raked back slightly may also be transom-sterned. The keels may also appear with a pointed stern, which suggests an overall double ended hull form. In the 1740s two keels are seen with bow winches for lowering the mast to the stern. Some are seen with cabins forward of their open holds. Vessels seen at Norwich have four or five reef points on their square sails. These sails are clearly intended to be of some considerable size, and appear in the Yarmouth Prospects examples with lifts for the yards. One of the moored keels seen in the 1742 Yarmouth Prospect may have a beak extension forward, as her bow extends over the bank.

In the 1741 South West Prospect of Yarmouth two of the square sailed craft depicted do not specifically fit the outline description of Norfolk keels, in that they bear their mast in the forward third of the craft. The South East Prospect of the City of Norwich example of a barge with lowered mast also suggests that she carried her mast in the forward third of the craft, to the front of the hold area. The few barges seen in the 1740s with mast stepped forward or amidships all carry a square mainsail. This mast position may be seen in either double ended or transom-sterned hull shape. They are also seen with open hold, with a covered cargo or hatch covers, or with a capacity for passenger travel.

The above do not have appropriate rig, even though with forward stepped mast to suit the wherry outline classification. The

rowed boats seen in the Prospects were most likely used for short distance or passenger carriage, and similar craft on the Thames were known as wherries[49]. The larger of these hulls may have been adapted to carry a tabernacle and mast, with gaff rig, thereby becoming a source in name or in nature for the passenger-carrying sailing wherries of the later eighteenth century, all generally smaller in size than the keel genre.

There are large numbers of craft seen at Great Yarmouth and Norwich in 1740s as these are the two principal ports of the Yare route. In the 1743 West Prospect of the Town of Great Yarmouth the variety of rigging and hull forms moored on the Bure, Yare and Breydon emphasise by their numbers the busy nature of the inland waterways as a main route of communication. All the barges use square mainsail.

The 1790 North West View of the Quay of Great Yarmouth may present two types that have distilled their form during the preceding 50 years. The keel carries more developed features in having a winch on the stern port quarter for the halyard, and on the centre forward deck for the mast lowering. She also has a cabin, coaming around her hold, and a beak appropriate to bow on mooring on a shallow river system in marshland valleys. The wherry has become a small gaff-rigged barge, having no winch for either halyard or mast, no cabin, and clean lines with no beak at the bow.

Fewer barges of any sort appear at Norwich from 1800 to the 1830s. However, Thirtle's paintings point out some of the variety of combinations of hull stern shape, deck fittings and mast positioning in the surviving Norfolk barges. Single masted vessels

in nineteenth century Norfolk may appear with: rounded (double ended) or transom stern with forward mast, rear cabin, gaff rig and covered hold; rounded or transom stern with central mast, square rig, forward cabin, and open hold.

Overall, Thirtle's paintings communicate a change in the balance of numbers of particular types of inland craft from those seen in the eighteenth century. Whereas the 1740s saw square sail dominate gaff on the inland routes, the 1790 North West View of the Quay of Great Yarmouth signalled a new balance of popularity between the two types. With Thirtle, in the early years of the nineteenth century, we see the gaff rig and double ended hull form becoming ever more to the fore. As in Thirtle's River Scene with Laden Wherries and Figure, wherein hay or reed collection on gaff rig barges and small boats is presented, there is but a ghostlike figure of a keel in the background - the square rig barges have become of less common note.

With the turn of the nineteenth century, keels and wherries are popularly continuing their leading position as carriers for the grain merchants, fish sellers and worsted weavers of Norfolk. The boom period slows down from 1810 to 1820. It is during this time that steam-powered craft first appear. By 1819 "the steam packet" takes the place of the "barge" advertising regular passenger services between Norwich and Yarmouth in the Norwich memorandum book[50].

After the 1830s, keels are far less commonly seen, in less variable circumstances than wherries. By the time that Stark is preparing his Scenery of the Rivers of Norfolk, the keel, as the

main large cargo carrier has already been largely ousted by the wherries (which have been built to a greater size), and the wherries ousted as passenger carriers by the steam powered craft. Keels are seen only in the more difficult pursuit of timber carrying.

The two masted barge variation is seen with square mainsail with topsail and square foresail; square mainsail with lug sail to the stern, possibly a steersail (Plate 22); or gaff mainsail with a square foresail. The extra mast and sail on each may act as a bridge sail. However, the location of each craft suggests that it is more likely that these have simply carried extra sail for greater steerage or power when handling heavy cargoes or difficult reaches, whether on inland journeys, working in the haven area, or trans-shipping in the Yarmouth roads[51].

Keels with topsail or foresail are also seen further north in the Humber and Tyne areas. In the eighteenth century a Prospect of Newcastle by S and N Buck shows keels with a single square sail, with foresail, with two masts or simply rowed[52]. The variety of rig and hull form demonstrated in the Prospect of Newcastle is comparable to that of East Anglia. The Newcastle keels have a rounded stern or are double-ended. The eighteenth century Newcastle vessels do not, however, carry a rudder. They are pictured with long rowing and steering oars. None appears to be quanted. The masts of some appear to be lowered along the hold, for negotiating bridges, as in Norfolk.

Double ended, carvel built vessels, also with sloop rig, are described as keels in the nineteenth century[53]. An example of a surviving keel, albeit the hull is steel built, and bears little

general similarities to the wooden, clinker-built eighteenth century barges, is the Humber keel presently preserved by the Humber Keel and Sloop Preservation Society. This keel has a square mainsail, with topsail. It worked in sea conditions in the larger Humber river. Its companion piece, the Humber sloop, also worked this area. The Humber and Tyne keels were built to deal with a deeper and wider river system than that of Norfolk, and one of their main inland and coastal carriage cargoes was coal, for trans-shipment to coastal vessels taking goods to East Anglia and London. Their East Anglian cousins could have adopted some similar rig for similar purposes.

During the eighteenth and early nineteenth centuries, the standard of rigging seems to be in a state of flux. Vessels with similar hull size, shape and use, carried rigging which varied according to fashion or need. There were both double-ended and transom-sterned vessels being built and used on the same waterways, carrying square or gaff rig on forward or central stepped mast. The various builders made working craft adaptable to the users' tastes in size and shape and uses on the river routes. A simple interpretation would be that once a simple hull form had been adopted, the owners simply rigged these according to the purpose they had in mind, or availability of rig to suit their pockets. Owners competing for markets may also have tried for combinations which would be more efficient in terms of speed or manoeuvrability in their particular line of trade of carriage.

The cost of manning a vessel, as an important element in the economic viability of a sail craft, may have dictated changes of

rigging form. Whereas keels, requiring two or even thee crew, could be handled well, a gaff rig, which allowed full control by one man only, had a clear economic advantage over the former. This economic pressure encouraged the further development of the late eighteenth century wherry type seen in the 1790 View - later wherries adopting use of winches and tackle suitable for single man operation.

It is misleading to consider the keel a forerunner or ancestor to the wherry[54]. The keels were a distinct, separate type of craft to the wherry. In the earlier eighteenth century, the only type of inland craft apart from square sailed keels regularly portrayed are rowed passenger boats. These are the more likely possible antecedents to the sailed passenger boat wherries in the latter half of the eighteenth century, in terms of function. The clinker hull build is common to each, as the greater majority of all locally built boats were clinker built. Where wherries have been regarded as "traditionally" double ended, in the early nineteenth century they appear to have been most commonly made with a transom stern, bearing thereby some similarity to the keels of the 1820s, which may have led to a confusion between types.

There appears to be a clear division between wherry and keel in the type of cargo being carried in the early nineteenth century. Stark's engravings, and the independent witness of the Sambroke keel, show keels carrying principally timber, always on the Yare, and never in the company of other keels. These vessels differ in placement of tiller, mast fittings, or stern shape, which suggested that they are not the same vessel seen at different points. The lone exception to timber carrying is engaged in (to the craft)

equally hazardous work in conveying ballast or gravel. The wherries appear in greater numbers than the keels, the hatch covered gaff type concerned principally with more weather protected goods and a greater variety of cargo, in use on the wider river system.

Both barge types are outmoded with the onset of the steam age, initially by steam powered boats. As the railways appear, both keel and wherry lose function as cargo carriers and, later, as passenger carriers. In the later Victorian age, the keels retain only minor use, their hulls making good tow lighters for dyke clearance, ballastage, and river maintenance. The wherries eventually become sports entertainment boats.

Part III

The Last of the Norfolk Keels

Part III

The Last of the Norfolk Keels

As indicated by the nineteenth century iconography, and by their decline in trade use, after 1850 it is difficult to find evidence of many Norfolk keels continuing to navigate the Norfolk waterways. In 1887, Walter Rye reports in his Popular History of Norfolk that "The wherries have quite superceded the "keels", which used to be the only boats sailing on these waters, and which carried a great square sail stepped on a mast amidships ..."[1].

In the late nineteenth century, various remaining pictorial and documentary accounts point to a single survivor. This was owned in the late 1880s by "Dilly" or "Tiger" Smith - "a notorious character, Tiger Smith, used to bring up timber to Blyth's timber yard opposite Hospital Meadow in the last keel. Then Hobrough's bought her and she was turned into a lighter"[2].

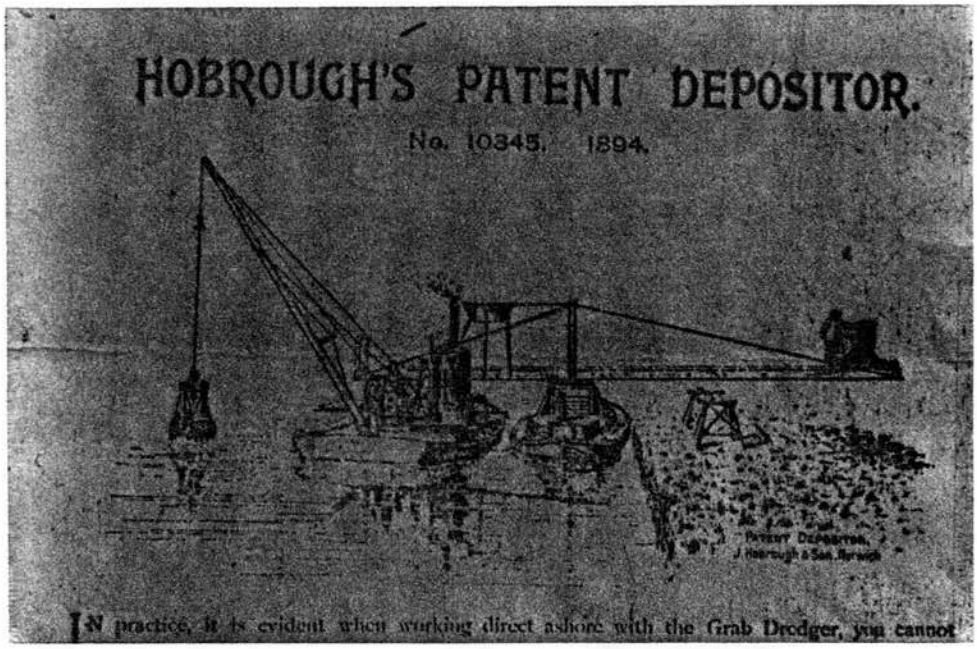
From the early nineteenth century, the Hobrough family of Norfolk held a distinct interest in Norfolk inland navigation. Henry Crosskill Hobrough was one of those sub-contracted to excavate a section of the New Cut, or Norwich to Lowestoft navigation channel, in 1831. From 1854, Hobrough and Son (the son named James Hobrough), river contracting firm, was based at Mousehold in Norwich, concerned with dredging, pile driving, weed cutting, lighterage, salvage and embankment or foundation work. In 1888 the firm became James Hobrough and Son (the son then being James Samuel Hobrough) advertising in steam dredging.

James Samuel Hobrough developed an interest in photography, and from 1893 began recording various features of the firm's work. It is through his interest that a further record of the last of the keels has survived.

In 1894 the Hobrough firm patented "Hobrough's Patent Depositor", patent number 10345 (Plates 27, 28)[3]. The apparatus was designed to alleviate the problem of lifting dredged material from well out into the river channel, and carry it well over onto the river bank. It was supported "on the hull of the last surviving Norfolk keel"[4]. The keep appears both in the illustration attached to the depositor advertisements and in J S Hobrough's photographs:

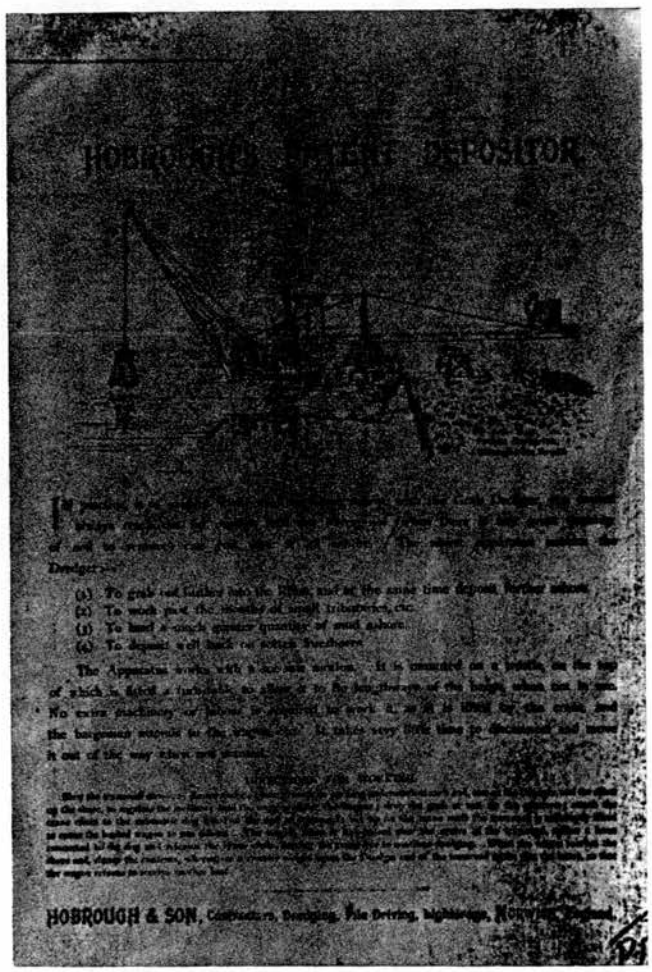
> "In practice it is evident when working direct ashore with the grab dredger, you cannot always reach out far enough into the river, nor (when there is any great quantity of soil to remove) can you stow it all ashore ... The apparatus works with a see-saw motion. It is mounted on a trestle, on the top of which is fitted a turn table, to allow it to lie lengthways of the barge, when not in use. No extra machinery or labour is required to work it, as it is lifted by the crane and the bargeman attends to the wagon, etc. It takes very little time to disconnect and move out of the way when not wanted."

The photographs showing the keel and depositor were taken between 1894 and 1896[5]. The earlier 1894 photographs show the keel hull with forward cabin, cabin door on port side, a short chimney placed forward on the cabin roof, and a wooden trim around the edge of the cabin roof. On the starboard side deck are two bollards, one toward the forward end of the cabin, one aft of the cabin. The forward winch appears to be put to some use, having rope wound on the barrel. Before the winch is a stem-head fitting or horse, one foot of which is fixed over a short beak at the stem. A coaming



IN practice, it is evident when working direct ashore with the Grab Dredger, you cannot

27

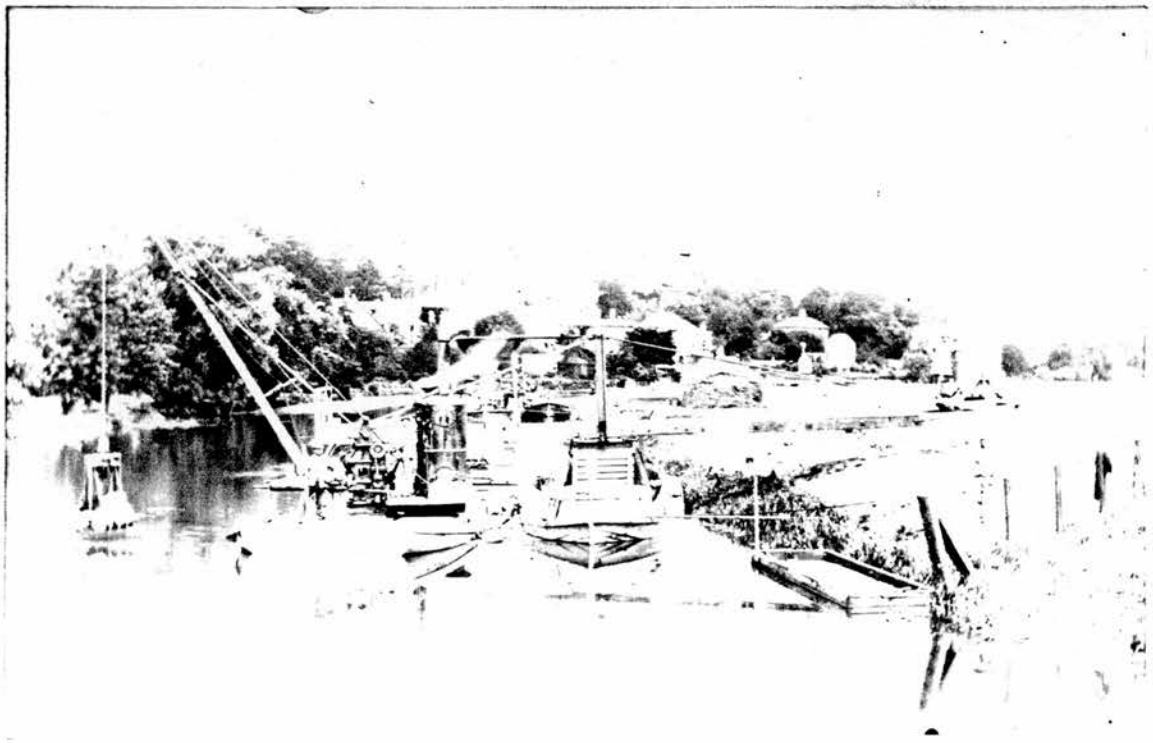


28

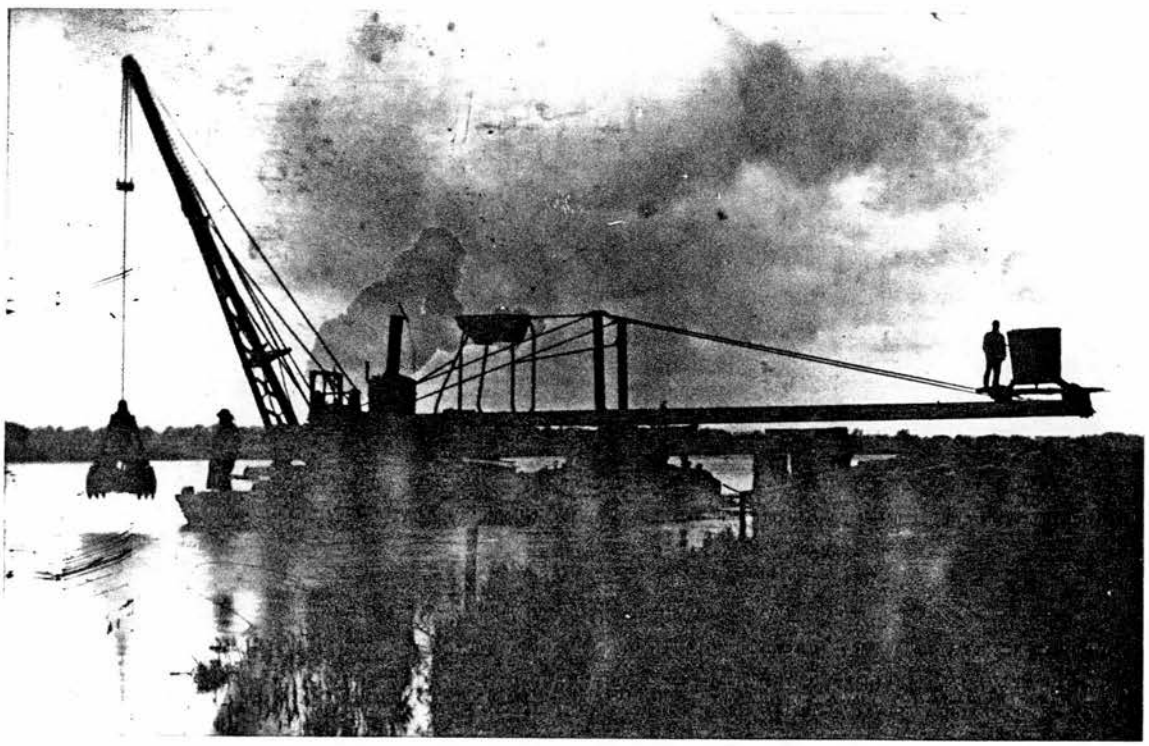
runs around the top of the open hold. The bow appears very broad, and a view to the waterline shows that her top strakes are carvel joined. The depositor structure on board appears to be built on an open framework of heavy beams, forward and side struts set into the inside of the hold.

A later photograph taken in 1895 (Plate 29) shows a wide angle view of the keel hull with depositor on board working alongside another barge carrying a crane and grab. In this view the bow shows clinker strakes below the carvel top strakes. The craft overall appears to be very beamy, and loaded to a waterline at the level of the lowest carvel strakes. A further feature of the cabin structure, a porthole or slide covered window, is apparent on the port side. The forward stepped chimney on the cabin appears to have acquired an extension, perhaps to keep smoke channelled to a higher level for the benefit of the barge men. Further changes appear in the depositor structure - the open framework being part covered with horizontal planking.

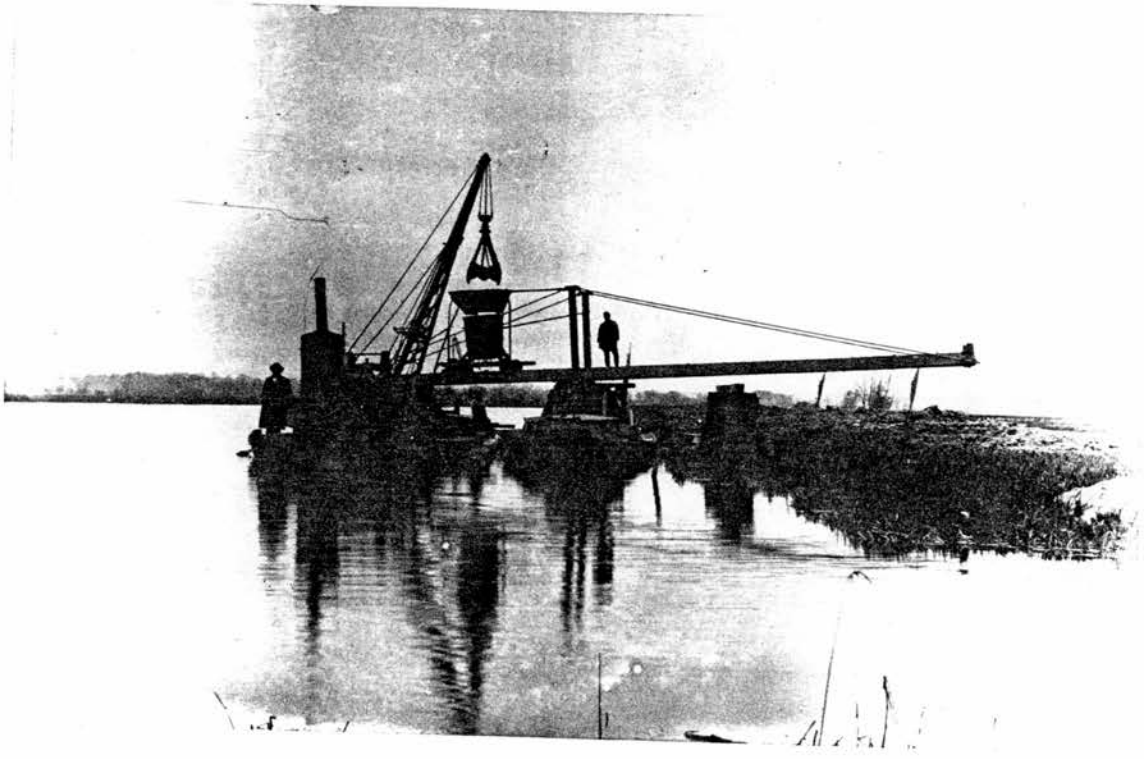
In 1896, J S Hobrough took many photographs of the depositor at Strumpshaw Train reach (Plates 30, 31) from a new railway bridge. In these the hull appears with upright extensions to the coaming around the hold. The port side view also allows a glimpse of the side decks toward the stern, where a single bollard appears. There are also two bollards placed, as those on the starboard side, near to the forward cabin. The tiller is also visible extending toward the rear of the hold. The chimney problem has yet another alternate solution - a section of angled pipe has been placed over the chimney hole.



29



30



31

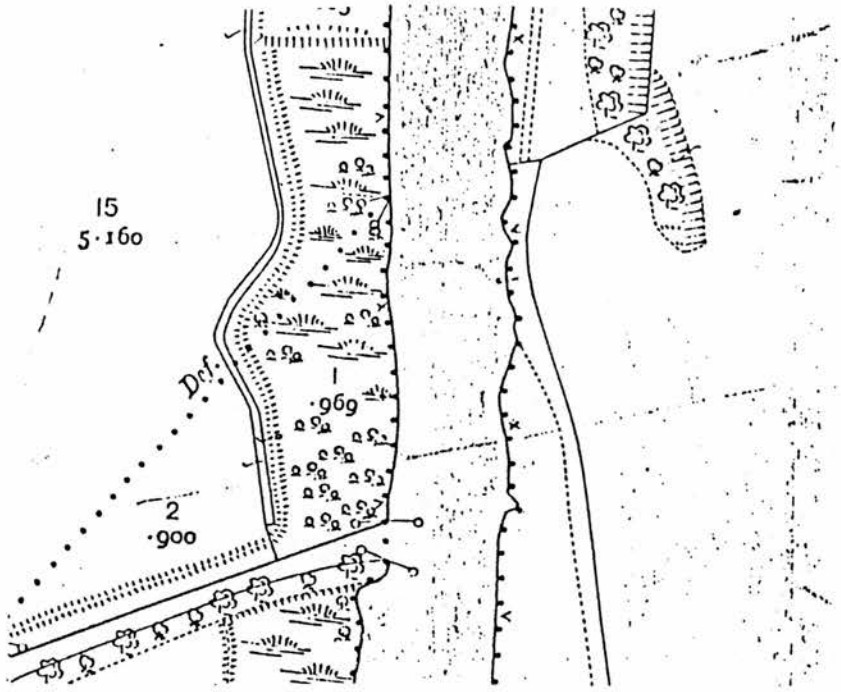
Two wide angle photographs (Plate 32) show stern views of the depositor keel. The transom stern in both photographs sits entirely above the waterline, carrying a large rudder with tiller. The lines of carvel and clinker strakes again belly out from the stern to give the impression of a craft very beamy amidships.

Overall, the photographs, and the progress of the Hobrough firm, describe some of the last uses for the older keel and wherry hulls, as tow lighters or support barges. At some time, near to the turn of the century, the old keel hull of J S Hobrough's photographs ceased to be viable as support for the depositor, but there is little surviving documentation to suggest when she came to her final resting place.

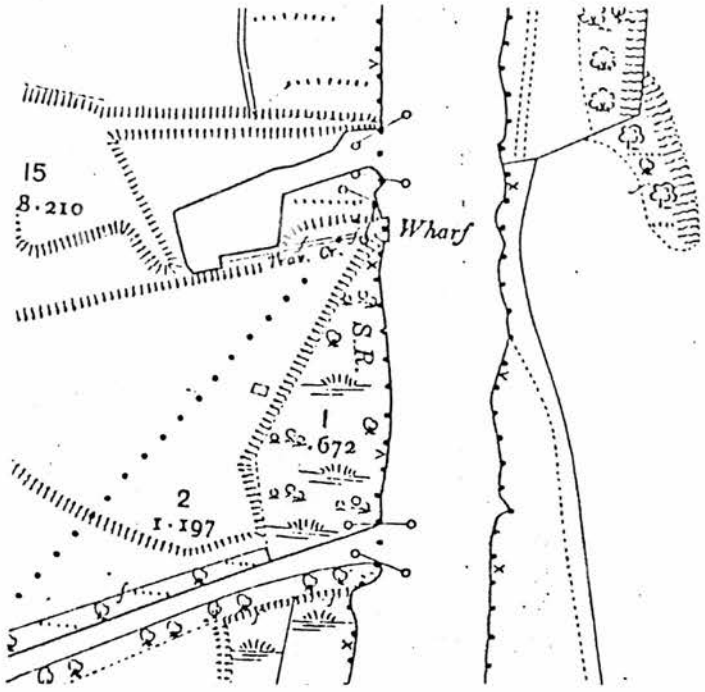
In 1912 a private interest in working boats by Mr Hall, a local model builder, was directed to a point on the river bank at Whitlingham on the Yare, opposite the Postwick Grove. With the approval of J S Hobrough (who became sole director of the company in 1901 with the death of his father), an excavation project was undertaken to uncover as far a possible the remains of a sunken keel[6].

The western bank of the river at this point was known as "Hobrough's Level". Hobrough's lighters unloaded waste from the city of Norwich in this open area, the waste allowing land fill. A pool had been cut in from the main river channel after 1907 (Plate 33), made up with wharf facilities for unloading barges, with a further jetty for unloading on the river itself. The keel had been used to shore up the south side of the pool cut entrance. It is suggested therefore that Hobrough's keel was deposited at

32



1907



1914

33

Ordnance Survey : Whitlingham Marsh

Whitlingham at some time between 1907 and 1912, with the excavation and opening of the barge pool.

Mr Hobrough's interest in his vessels continued. On January 24th 1923, the curator of the Castle Museum, Norwich, wrote to thank Mr Hobrough for his generosity: "It was a splendid suggestion of yours that he (Mr Hall) should be invited to make a model of the keel and needless to say I am very pleased to hear that you will contribute towards the cost". A model was duly made, and is catalogued in the Bridewell Museum records from 1923.

The Bridewell Museum Norfolk Keel Model

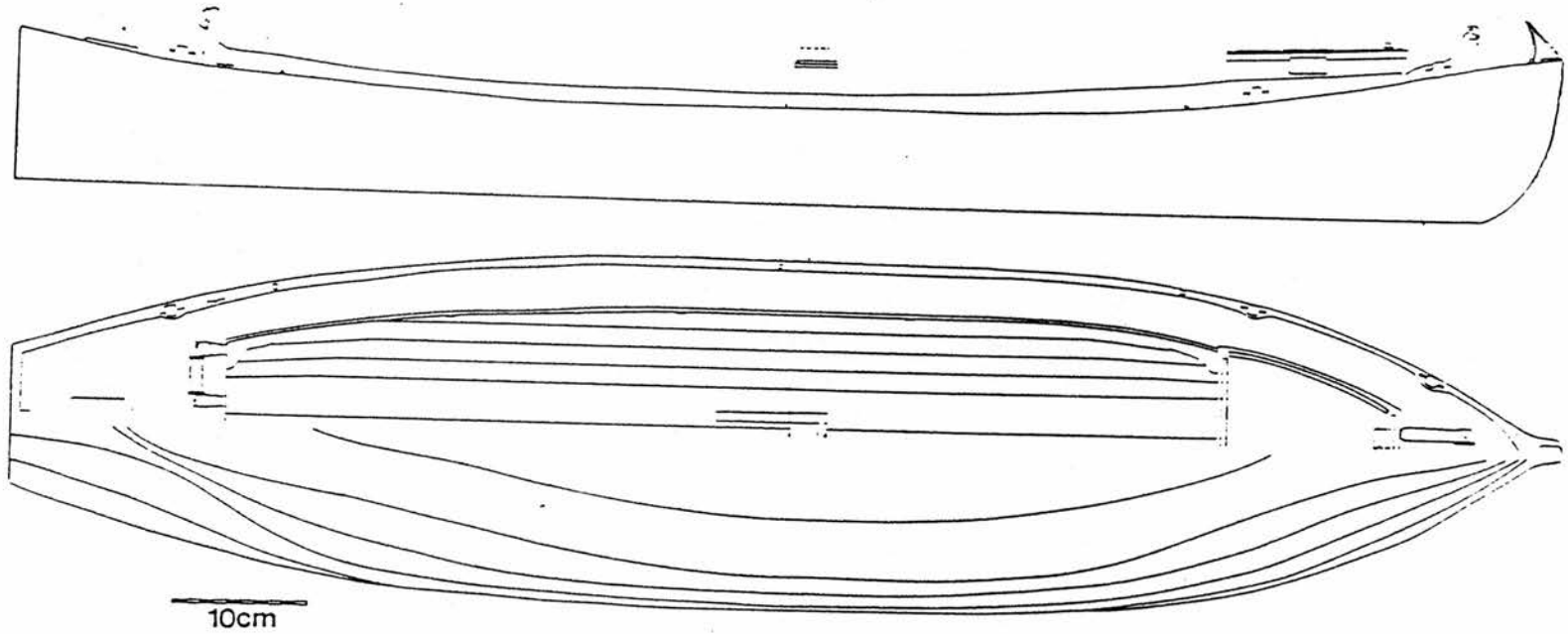
The Bridewell Museum model of a Norfolk keel is built on the scale 1:16. Plates 34, 35 and 36 represent this model. The scaled equivalent measurements are as follows:

	(m)	(ft)
Length overall	18.56	60.80
Fore beam (20cm from bow)	3.29	10.81
Beam amidships	3.68	12.07
After beam (30cm from stern)	3.96	12.99
Length of stem	2.03	6.66
Length of sternpost	1.85	6.06
Depth at after beam	1.42	4.65
Depth at amidships	1.37	4.49
Length on keel	17.60	57.70
Height of Mast from hold deck	8.46	27.75

The Bridewell Museum model was supported until 1967 with the information that:

> "'Keels' were used extensively from the 16th century to the late 19th century, to carry cargoes on the shallow waterways in the Broads district of Norfolk. Large poles called 'quants' were used to propel the boat when winds

34



NORFOLK KEEL

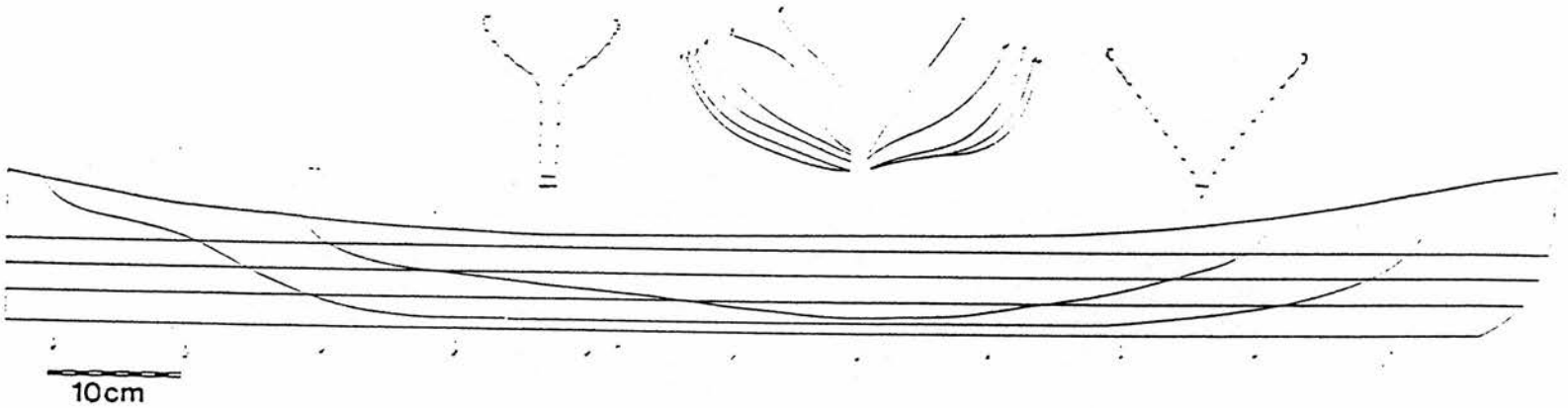
BRIDEWELL MUSEUM MODEL

Built by : W. H. Hall 1923

Overall Length : 116cm Max. Breadth : 23cm

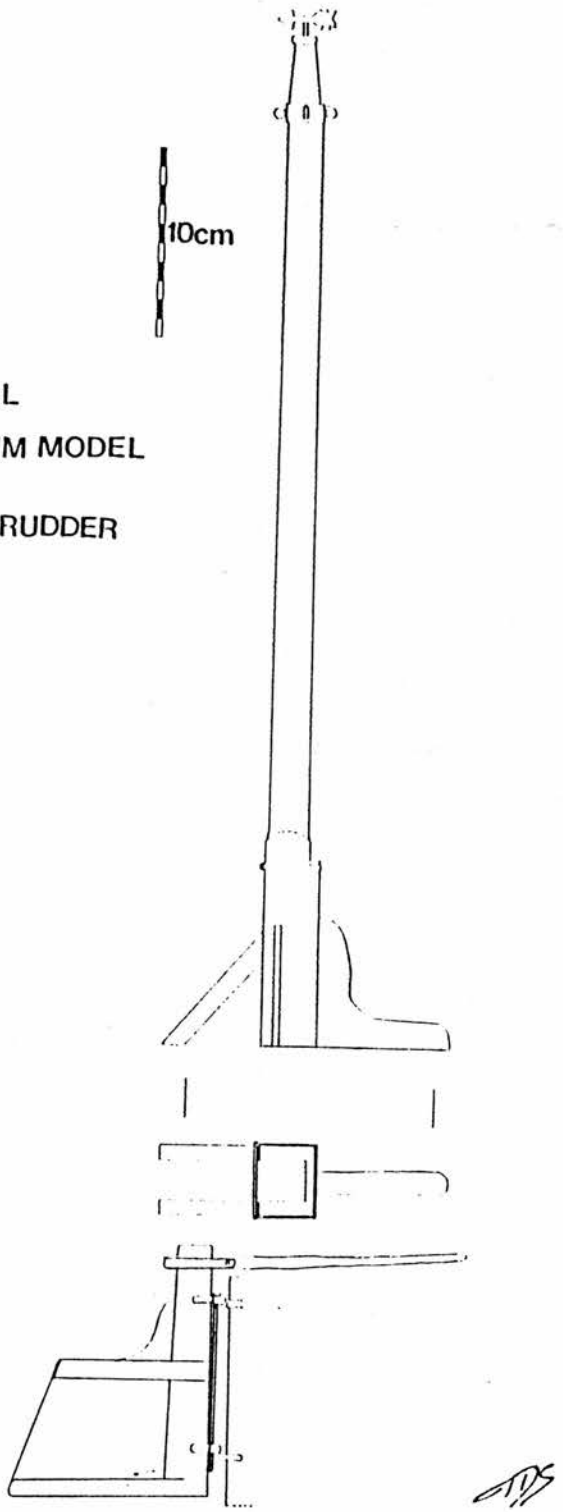
ITB.

35



NORFOLK KEEL

BRIDEWELL MUSEUM MODEL- LINES PLAN



36

NORFOLK KEEL

BRIDEWELL MUSEUM MODEL

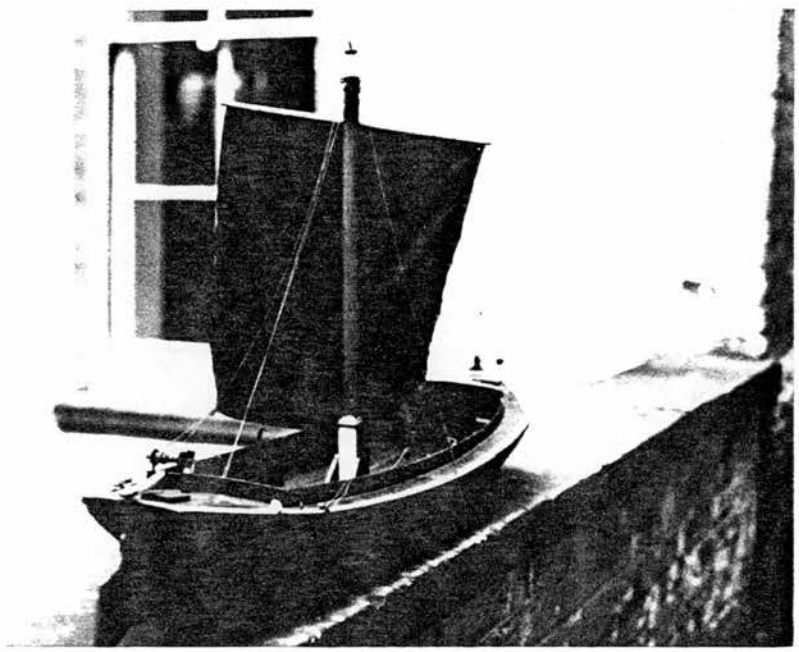
MAST, TABERNACLE, RUDDER

were unfavourable. The mast could be lowered to enable the 'keel' to pass under low bridges. The hull had a transom stern (square stern) and was clincher-built (planks overlapped and rivetted)."

The Bridewell Museum model is finely built of light wood. She has a deep very gradually curving stem (Plate 37). The keel is quite narrow. The stern post, with transom, is straight (Plate 38), and carries a large rudder on gudgeons set in both sternpost and rudder, an iron rod running through both sets (Plate 39); there is a large straight tiller set over the top of the rudder. The rudder of this model makes 6.44 ft in length, and the greater width section is 3.94 ft high. There are loading line markings at the stern up to the fourth strake. She is entirely clinker built, with 10 strakes each side. She has forward, stern, and side decks or walkways, on which are two sets of two bollards forward, one set of two bollards to the stern (Plate 40). The open hold is lined with carvel planking which does not allow a view of the framing. There are four large horizontal knees at the transverse members marking each end of the hold (Plates 40, 41).

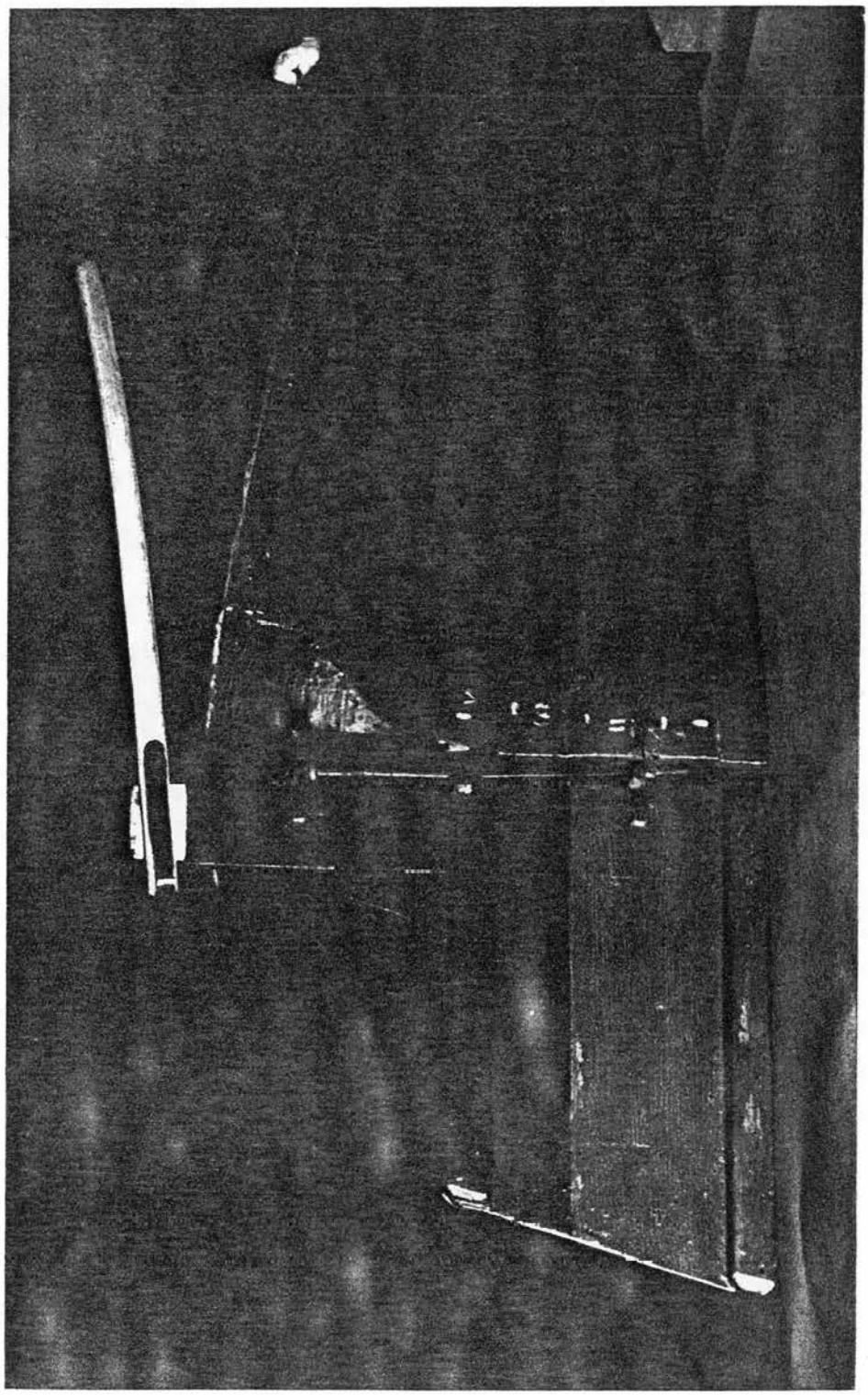
A small forward cabin has a hatch opening on her starboard side, a rectangular window opening on the port side. The chimney is set well forward and on the cabin roof, and there is a trim running around the roof edge entire. A coaming runs the full length of the hold supported by three uprights set into the hold deck ceiling on each side, and before the aft deck. On the centreline of the aft deck there is a square piece indicating a hatch cover for stern storage.

On the forward deck (Plate 42) there is a triangular stem head

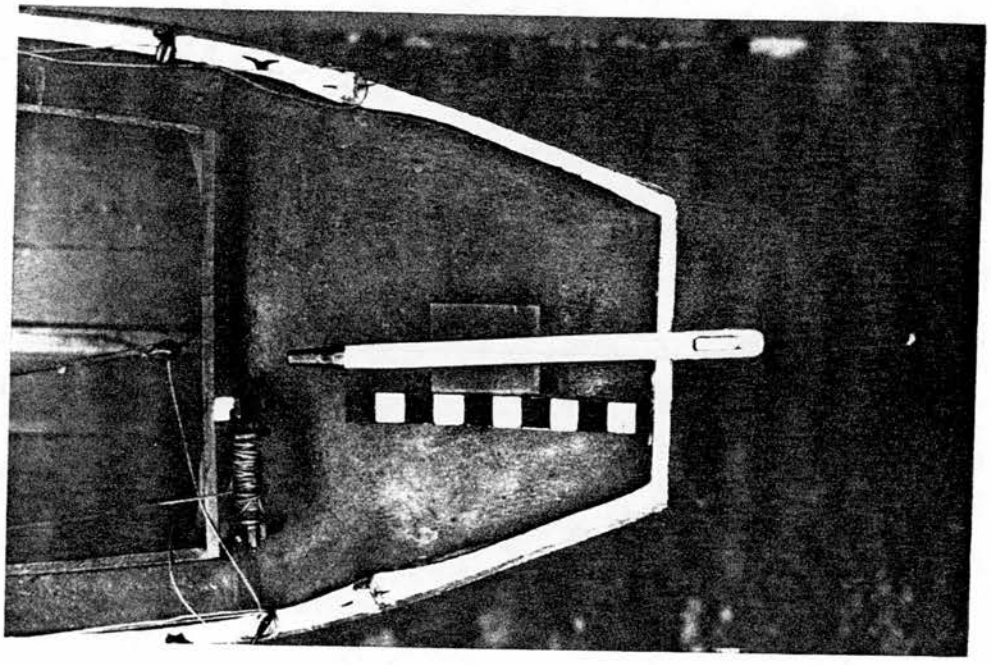


37

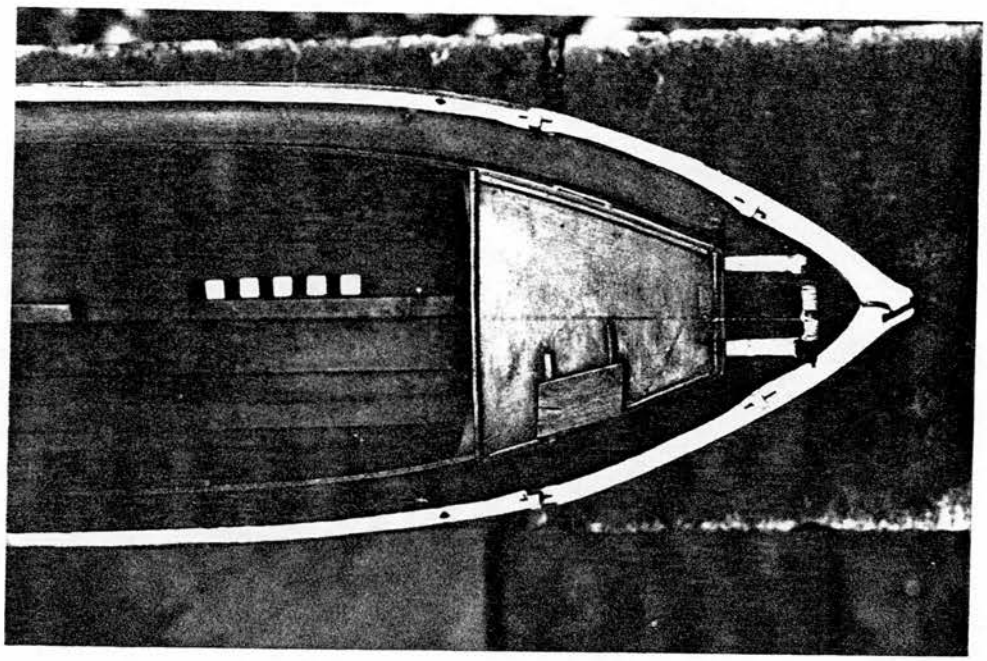
38



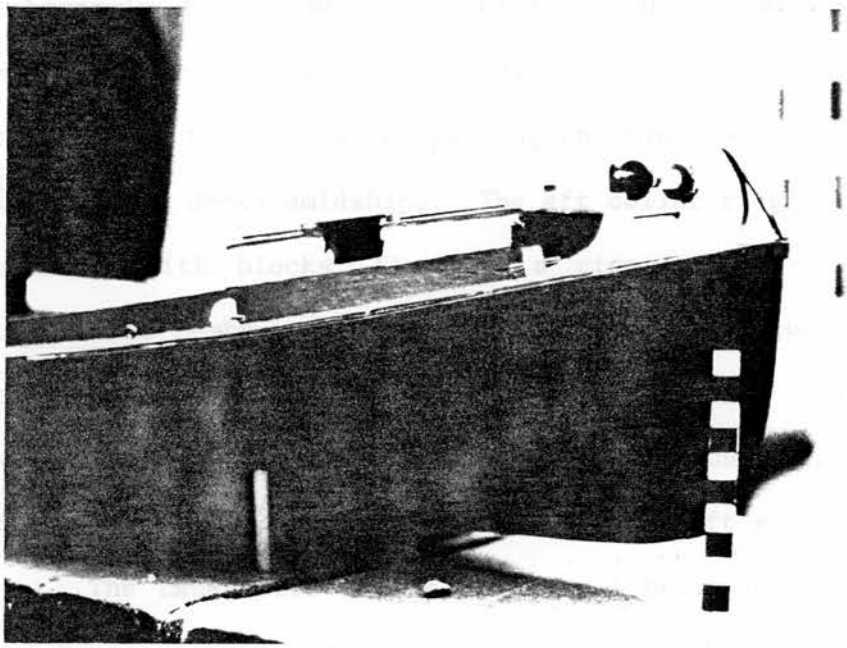
39



40



41



42

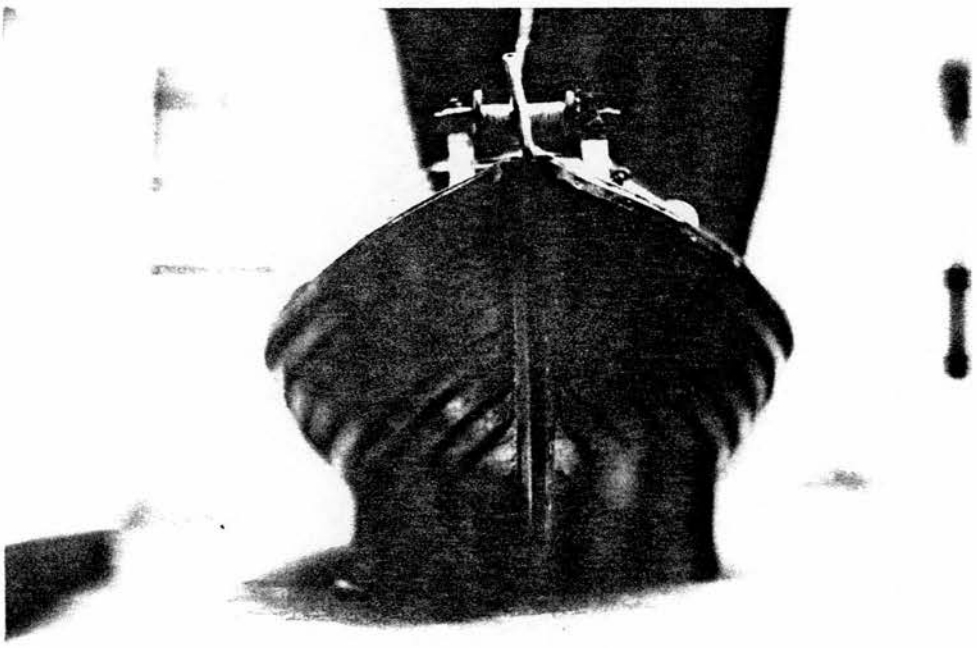
fitting or horse, its forward foot attached to the extreme forward part of the beak over the stem. A forward winch (Plate 43) is set in heavy L shaped uprights, which butt onto the forward end of the cabin structure. A line leads from this winch to a ring at the masthead. The stern winch (Plate 40) is set on the port side of the aft deck, its upright supports braced by blocks against the aft hold coaming.

The mast is stepped just before amidships in a large box tabernacle (Plate 44), and carries an arrow weathervane. The masthead carries a collar with four rings (Plate 45). Two of these rings carry the shrouds supporting the mast, attached below to rings in the side decks amidships. The aft collar ring attaches a doubled backstay with blocks, fixed to a ring to the centre of the aft transverse member of the hold. There is a sheave near the top of the mast. The spar carries a large, black, rectangular shaped square sail, at clew and tack of which are sheets for attachment to cleats and rings placed on the forward and aft side decks[7].

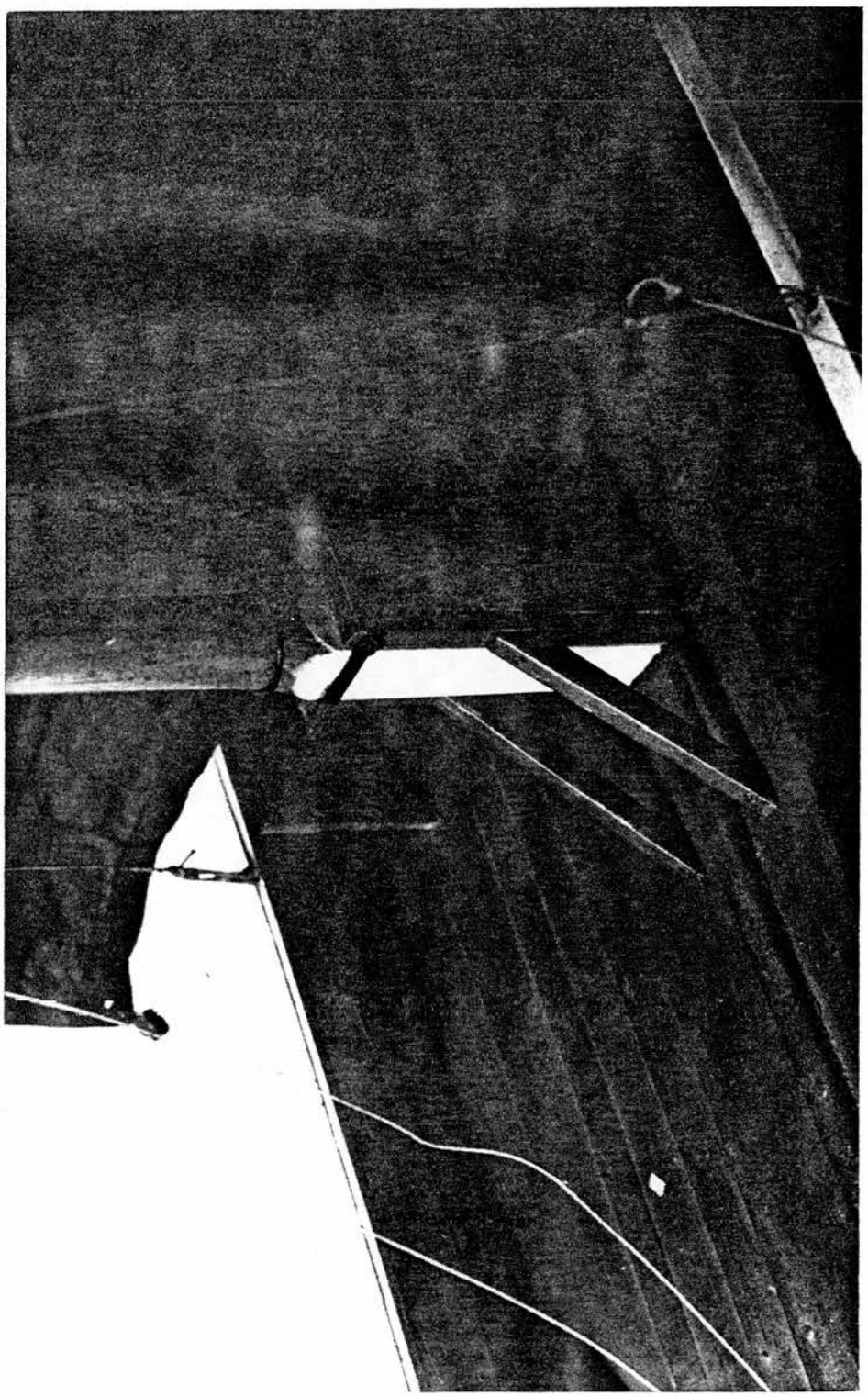
The tabernacle is supported by a heavy upright knee forward, two braces either side of the keelson toward the stern. It is open aft, with a locking bar across the top opening. The mast would lower to the stern, although there is no counterweight at the mast foot.

The Science Museum Norfolk Keel Model

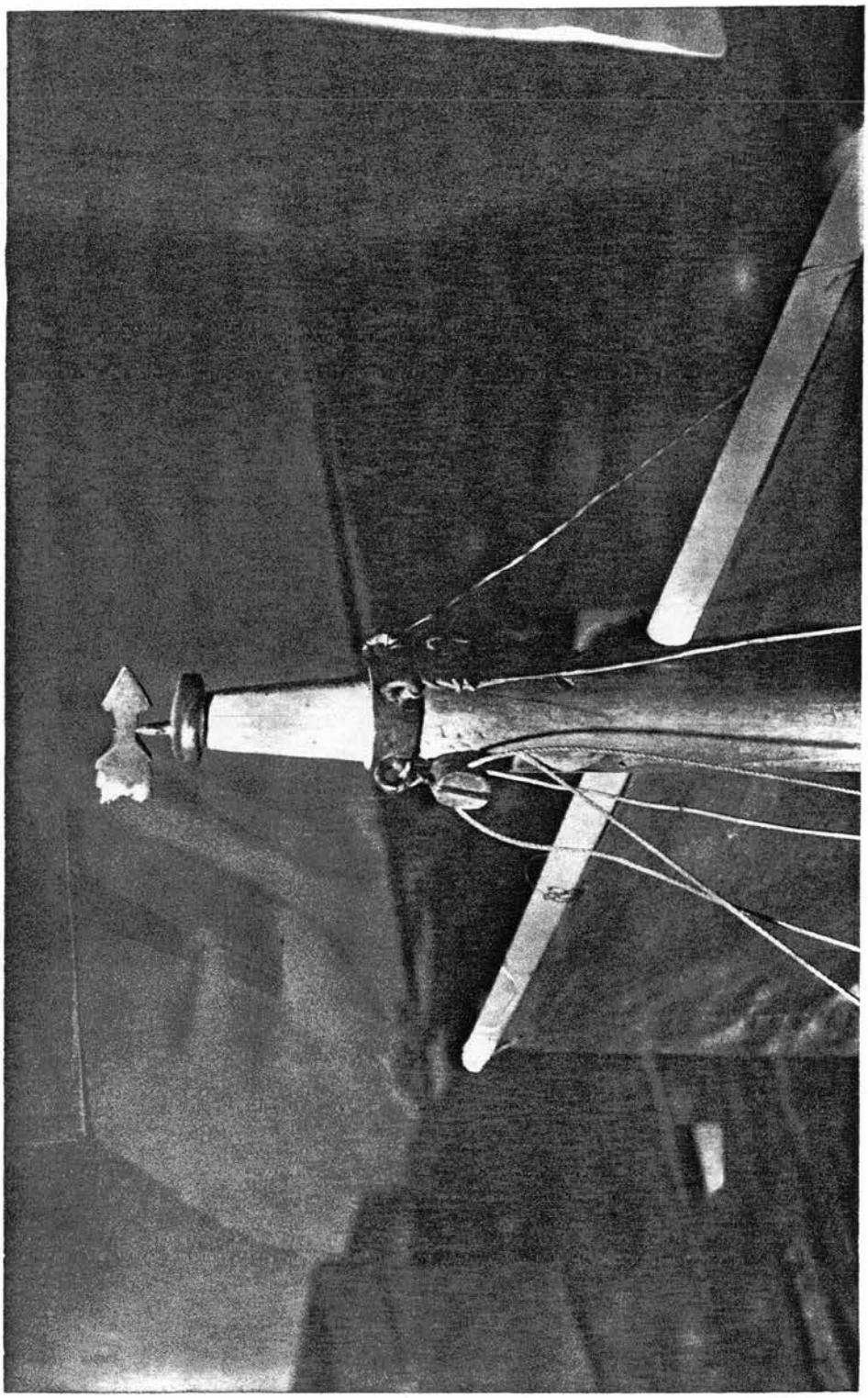
In 1929 a Norfolk keel model was accepted and inventoried by the Science Museum, Kensington, again made by Mr Hall. Notes



43



44



45

accompanying the model up to 1952 stated that:

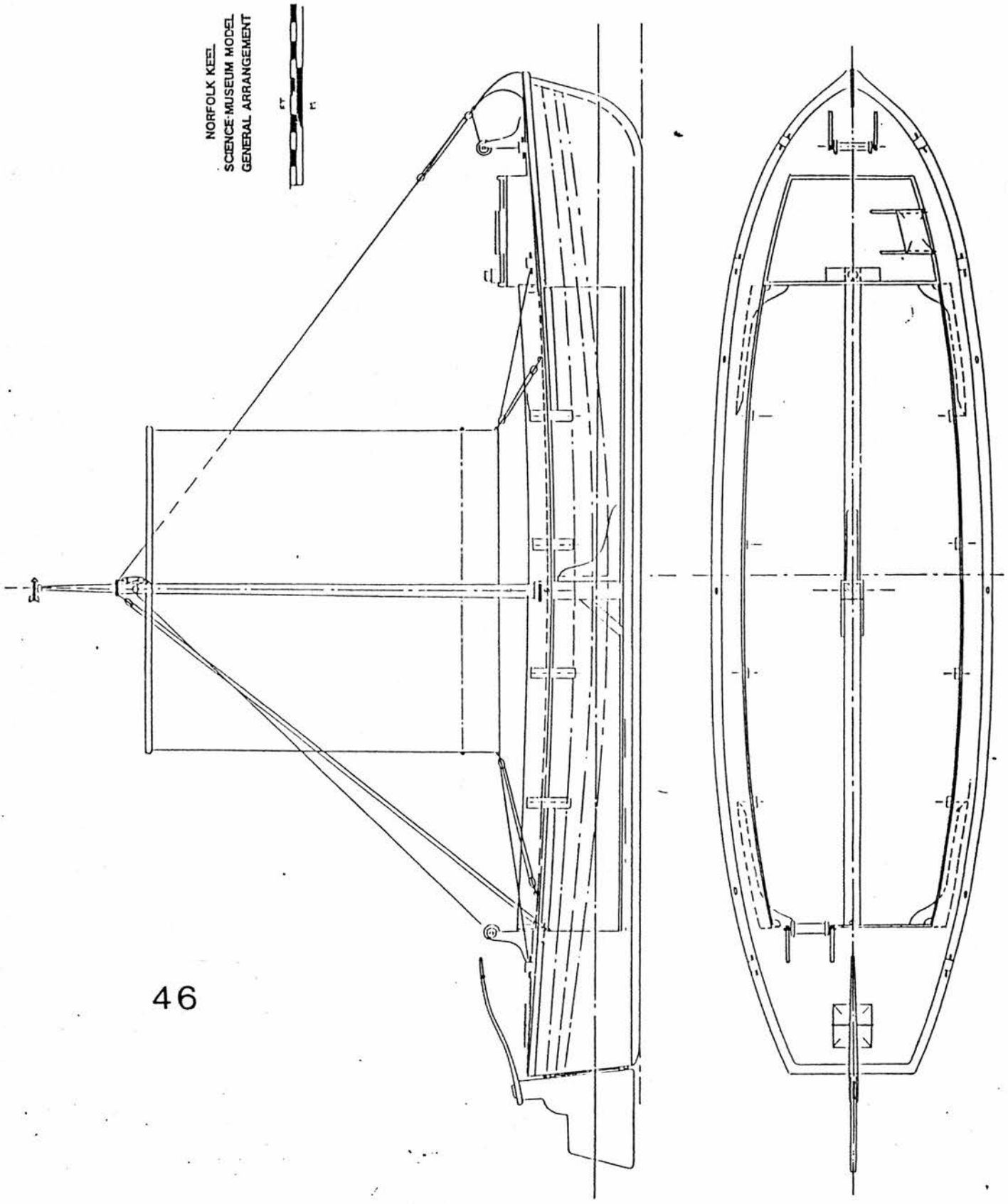
> "Norfolk keels are now extinct, but they were in use on the Norfolk Broads from the middle of the sixteenth century until the latter part of the nineteenth. This model was made by Mr W Hall of Oulton Broad in 1928 from measurements taken by him and four others, some sixteen years earlier, of a Norfolk keel which lay partially buried in the river bank near Poswick Grove, some 4 miles below Norwich. The keel in question had been in use for timber carrying until 1890."[8]

The Science Museum model of a Norfolk keel is built on the scale 1:16. Plates 46 and 47 represent this model. The official and measured scale equivalent dimensions of the Science Museum model are:

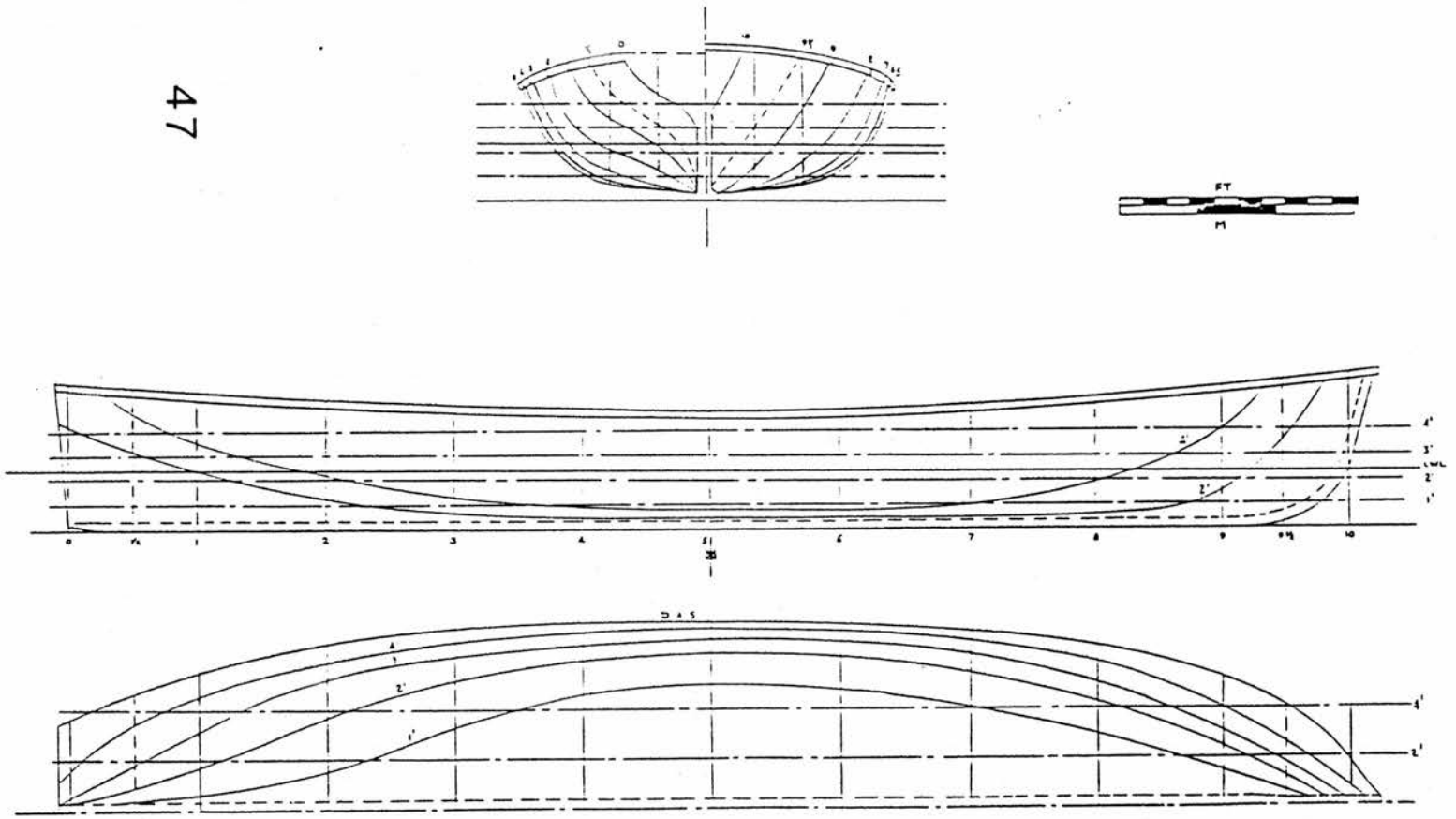
	(m)	(ft)	Museum Records
Length overall	16.85	55.30	54.5ft (16.61m)
Fore beam (20cm from bow)	3.96	12.99	
Beam amidships	4.66	15.30	14.5ft (4.41m)
After beam (30cm from stern)	4.54	14.80	
Length of stem	1.98	6.49	
Length of sternpost	1.85	6.06	
Depth at after beam	1.56	5.11	
Depth at amidships	1.46	4.80	4.2ft (1.28m)
Length on keel	15.45	50.70	52.0ft (15.84m)
Length between perpendiculars	16.24	53.30	
Height of mast from hold deck	9.92	32.50	

The Science Museum Norfolk keel model bears great overall similarity to the Bridewell Museum model. She does, however, bear various differences in hull shape and fittings (Plate 48).

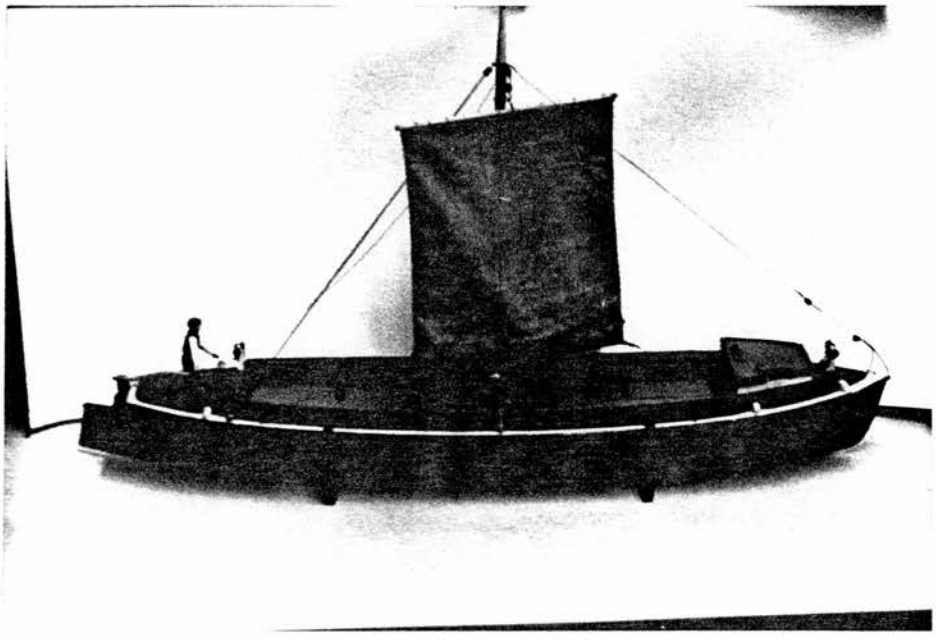
The Science Museum model has a slightly raked stem and very slightly raked transom stern. There are loading line markings at the bow. The rudder shape is raked back to conform with the shape of the stern, the tiller with an upturned shape (Plate 49). The rudder of this model makes 5.5ft in length, and the greater width section is 3.5ft high. The rudder is again hung on gudgeons on both


NORFOLK KEEL
SCIENCE-MUSEUM MODEL
GENERAL ARRANGEMENT
FT
1'

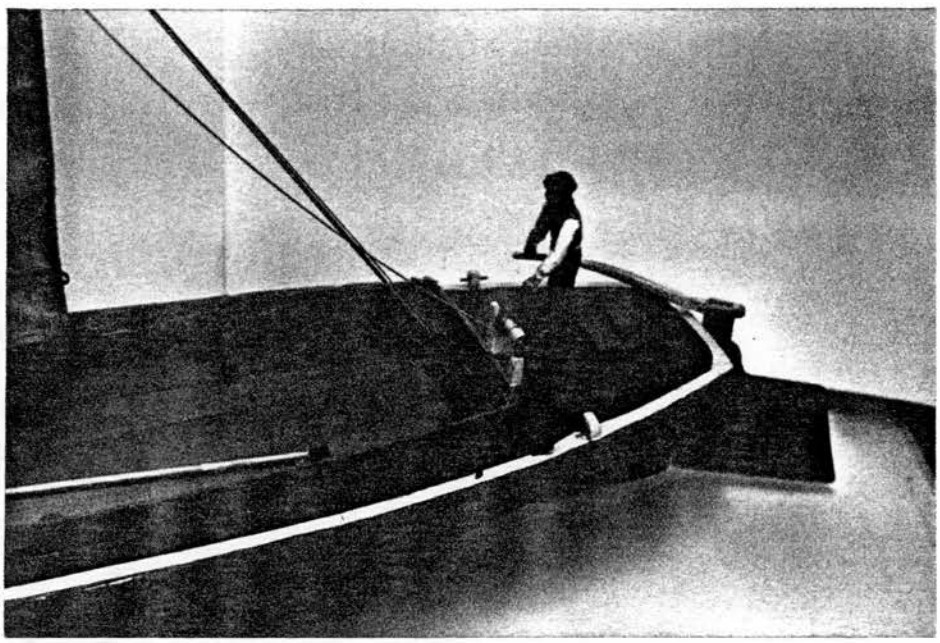
46



NORFOLK KEEL
SCIENCE MUSEUM MODEL
LINES PLAN



48



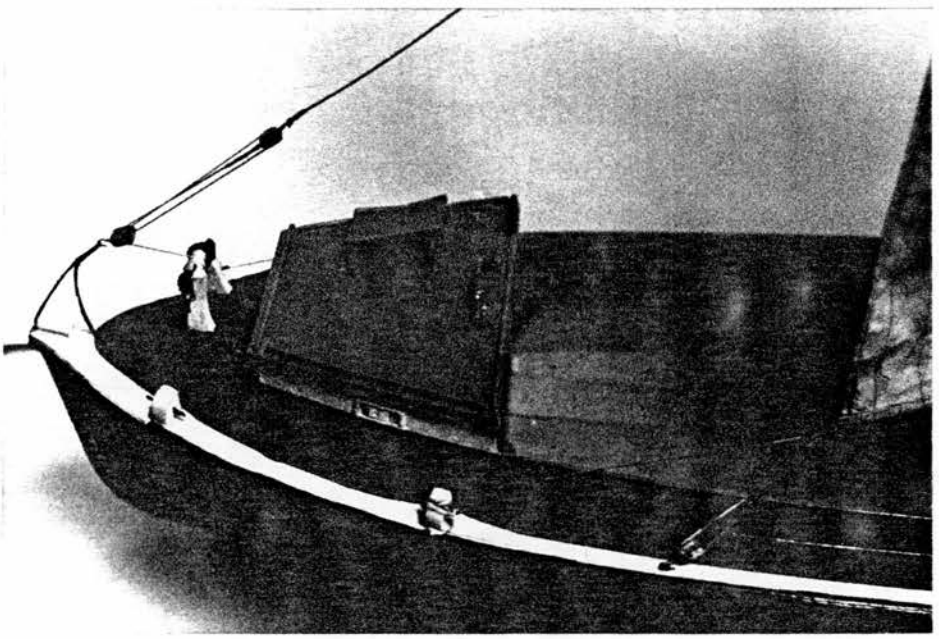
49

sternpost and rudder, with an iron rod running through both sets. She is as the Bridewell Museum model, clinker-built with 10 strakes each side. She has forward, stern and side decks or walkways, with bollards placed in a similar position to the Bridewell model. The open hold is again lined with carvel planking which does not allow a view of the framing. There are again four large horizontal knees at the transverse members marking each end of the hold.

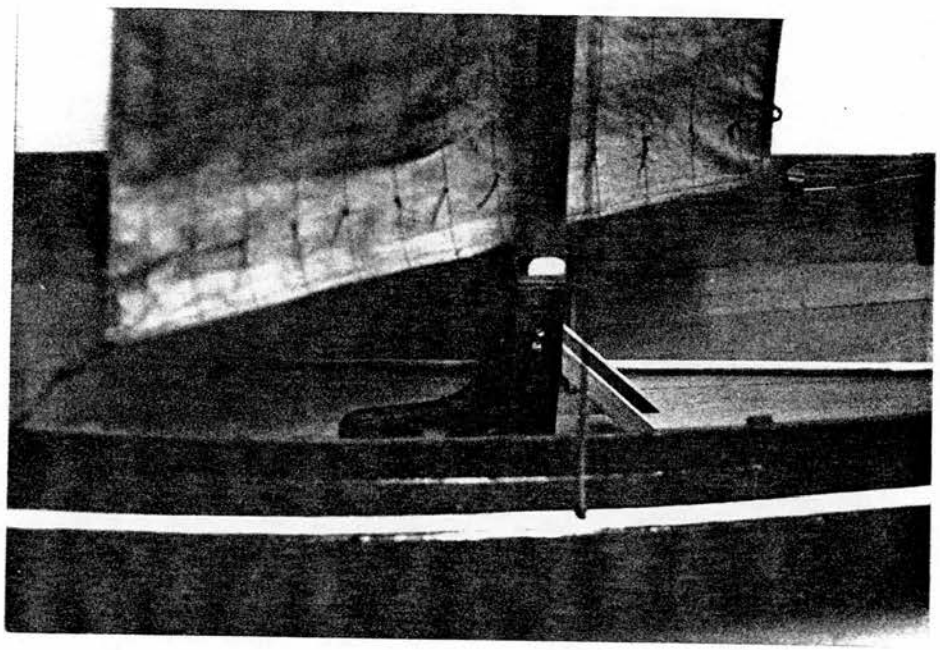
The small forward cabin has a hatch opening on the starboard side. The chimney of this model (unlike the keel seen in the Hobrough photographs) is set to the aft end of the cabin roof, and there is a trim running around the roof edge. The coaming runs the full length of the hold, supported by four uprights to each side. There is a hatch cover on the centre line of the aft deck.

On the forward deck (Plate 50) there is a triangular stem head fitting or horse, its forward foot attached to the extreme forward part of the beak over the stem. A forward winch is set in heavy L-shaped uprights, which butt onto the forward end of the cabin structure. The stern winch (Plate 49) is set on the port side of the aft deck, its upright supports placed directly against the aft hold coaming.

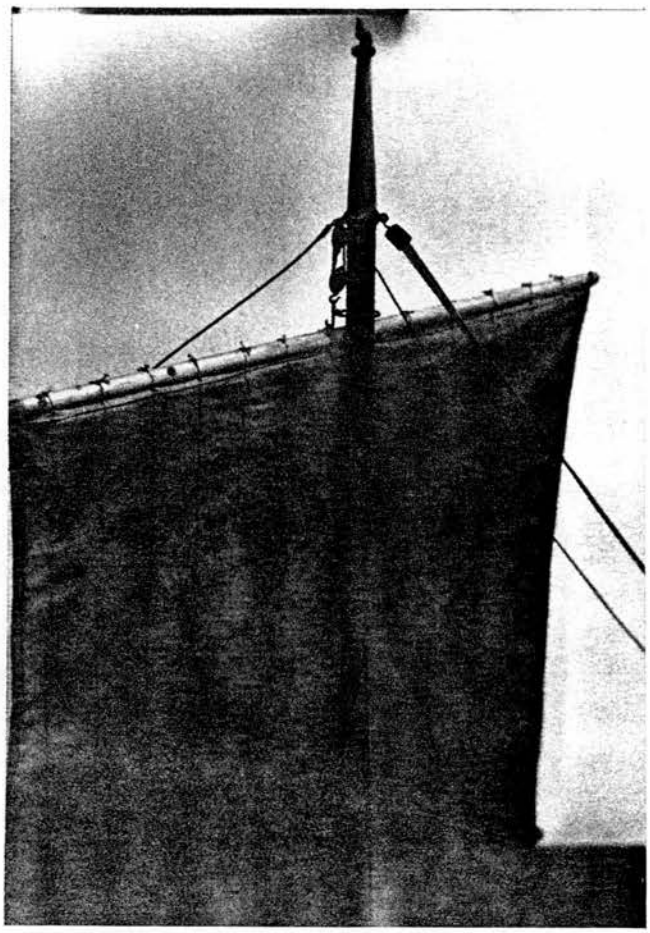
The mast is stepped just aft of amidships in a large box tabernacle (Plate 51) The tabernacle is supported by a heavy upright knee forward, two braces either side of the keelson toward the stern, and open aft with a locking bar across the top opening. There is no counterweight. The mast would lower to aft. The masthead again carries a collar with four rings (Plate 52). Two rings fasten a single shroud to each side amidships. The forestay



50



51



52

is attached by a three part tackle hung from the forward collar ring to the stem fitting. The end of the tackle leads to the forward winch. The aft collar ring attaches a doubled backstay with blocks, fixed to a ring to the centre of the aft transverse member of the hold. Through the mast sheave is threaded the halyard, which attends the aft winch. The spar carries a large rectangular black sail, at clew and tack of which are sheets with blocks for attachment to rings placed forward and aft on the side decks.

The Science Museum model appears quite square and buff, having a greater beam amidships in comparison to the Bridewell Museum model. The Bridewell Museum model also has a greater overall length, giving the latter a more streamlined shape. The stem of the Science Museum model is straighter than that of the Bridewell Museum. The models also differ in terms of cabin roof fittings, transom stern, rudder, and tiller shape; standing and running rigging, placement of coaming supports, placement and height of mast. There are also two quants accompanying the Science Museum model. the quants are 16ins or 40.6cm length, making 21.33ft or 6.49m in equivalent scale length. There is also a boathook of 14ins or 35.5cm, or 18.6ft or 5.68m in equivalent scale length.

Mr Hall, the model maker, may well have refined his views on shape and fitting of a Norfolk keel in the five year period between the making of the two models. It would seem feasible that when he took measurements in 1912, he may only have had a broad plan from which to draw his details. (Amateur archaeologists of the time did not have sub aqua apparatus available to them, making any underwater measuring somewhat hazardous.) The keel tabernacle is reported to

have been placed in Hobrough's yard at the time of the excavation[9], and other fittings, such as the rudder and tiller, may have been available for measurement elsewhere. Differences between the models may also be accounted for by the difficulties Mr Hall was presented with in drawing his information from a sunken outline, an oil painting (for running and standing rigging), and verbal accounts.

A newspaper account of October 10th 1931, in the "Eastern Evening News" indicates the continuing interest by Norfolk people in the vanished keels:

> "Probably a good many people are not aware that the remains of the last Norfolk keel were embedded, with those of several wherries, in the bank of the Yare at Whitlingham, where they help to save the bank from being damaged by the stream. This keel, which was last used afloat in connection with Messrs Hobrough & Sons' dredging work, was partly disinterred a few years ago so that Mr Hall might obtain particulars of its construction and dimensions.
>
> "The hull measurements obtained by Mr Hall gives its main dimensions, and will enable readers to have some idea of what the vessel was like. They are as follow:
>
> | | |
> |---|---|
> | Length overall | 55ft |
> | Fore beam (12ft from fore side of stem) | 12ft |
> | Amidships | 13ft 8ins |
> | After beam (8ft from after side of sternpost) | 11ft 2ins |
> | Length of stem | 5ft 10ins |
> | Length of sternpost | 5ft 4ins |
> | Depth amidships | 4ft |
> | Depth at after beam | 4ft 10ins |
>
> "The model of a keel to be seen in the Norwich Bridewell Museum was built by Mr Hall to scale with the above measurements and in accordance with further details supplied by an oil painting of the Whitlingham keel he found at Yarmouth in the possession of the widow of the man who last sailed it. Another model, also the work of Mr Hall, was made by him at the request of a representative of the South Kensington Museum, where it is preserved."

Verification of the actual dimensions, and structural detail of "the last of the keels" could only be gained by seeking out and considering the original vessel.

Part IV

The Whitlingham Keel

Part IV

The Whitlingham Keel

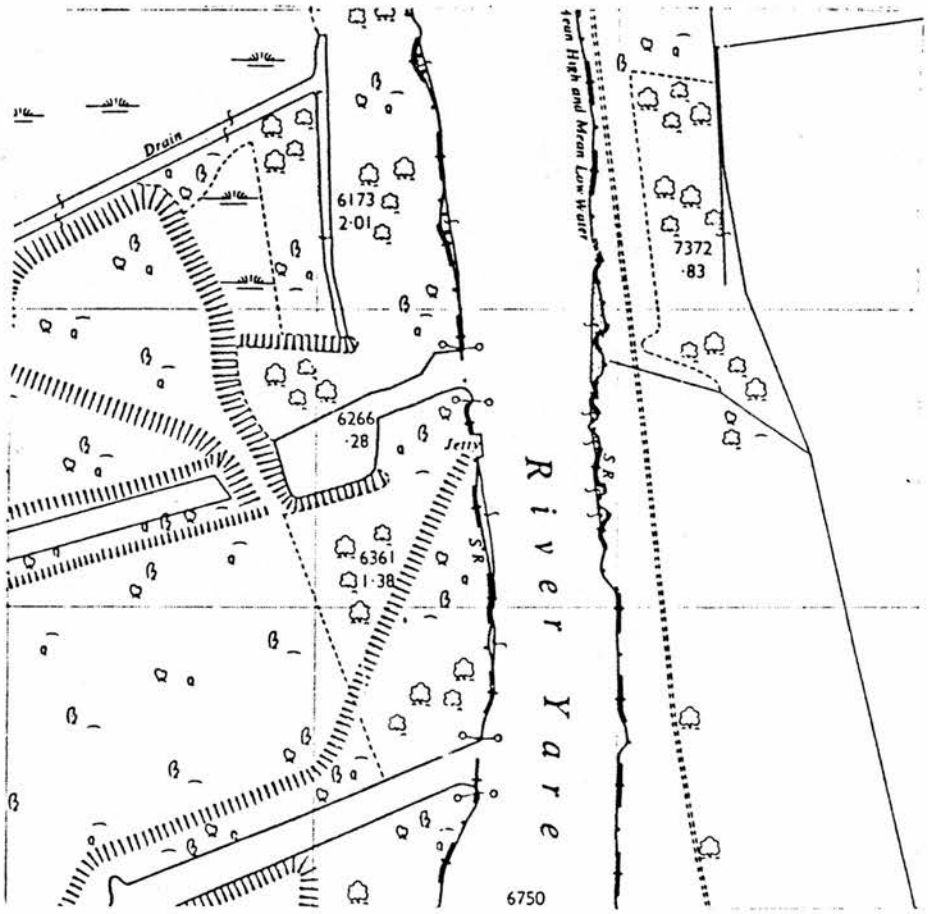
Discovery and Location

In April of 1984, Major James Forsyth of the Norfolk Keel Recovery Action Group asked for an underwater survey of the suspected remains of a Norfolk keel located at Whitlingham, south of the city of Norwich on the River Yare, opposite Postwick Grove (Plate 53). The Recovery Action Group had already been told, some years earlier, that little remained of this hull, as it had "been consumed by the worms in the earth". Major James Forsyth was not convinced by this, and consequently invited the Norfolk Archaeological Diving Unit to give a second opinion[10].

Initial Survey

The site, owned by the Anglian Water Authority, was accessible in the first instance by water transport. Little showed above water level but two large broken timbers, jutting out from a high bank consisting of light gravel, soil and concrete blocks overgrown by willow trees.

Underwater, visibility was extremely poor (from 50cm maximum to nil as silt was stirred up). However, close examination showed the forepart of the hull, which extended from the riverbank into the main river channel, to be virtually intact, standing proud of the river bed. Extending from the position of the broken timbers seen at low water, and below this level, the broken strakes of the upper



1984

53

Ordnance Survey : Whitlingham Marsh

part led down to whole strakes, these still joined solidly to the stem post extending from what appeared to be a flat base member. Metal fixings in the wood were still in place, ribs and some planking visible amongst gravel and brick infill.

To the northern side of the hull, the bank sloped down to water level. Here the natural current of the wide bend of the River Yare had deposited a great deal of silt. The silt was soft enough to allow inspection by touch to a distance of 1-1.5 metres from the broken upper members and inward from the hull end. Albeit conditions were such that the wooden members could not be seen, the hull appeared to be made up of overlapping, solid planks.

To the southern side of the hull, the bank prevented examination inward of the broken timbers.

The report to the Norfolk Keel Recovery Action Group[11] suggested that far from there being little remains, most of the hull was still in existence under the river bank. This was based on not only the condition of the visible members underwater, but the general conditions of preservation.

The hull remains projected into the River Yare, upstream from an old jetty which served as a tying up point for both unsolicited Broads holiday craft and River Inspectorate launches. As these were untied, and turned into a rising tide current, it was shown (through on site experience) that many craft would have turned stern into the bank, thus hitting the remains of the hull with propellers. The riverbank in this area has also suffered much erosion due to the effects of propwash from passing traffic. This was seen as both the cause of the hull being uncovered and damaged, and a threat to its

future survival.

Light, and flowing oxygenated water, combined to give the projecting part of the hull what would normally be poor preservative conditions. Such conditions encourage the growth of aerobic bacteria and photosynthetic base plants. Some green plants were seen growing on the gravel infill, and there were indications of a past moss like growth on the wooden areas. However, the site of the hull was a short distance downstream of a main drainage channel from the Whitlingham sewage works, which effectively lowered oxygen content in the immediate area and discouraged green growth. The general bank erosion itself in this reach of the Yare had provided some material for the buildup of silt to the northern side of the hull. The survey had shown some methane content in this surrounding silt, which also concealed most of the northern side effectively from light.

Water in this tidal river holds a low saline content. This had not, however, caused chemical interaction or corrosion to metal parts of the hull to a great enough degree to have caused them to cease to be effective in holding the hull together in the bow section.

Overall, given the remarkable solidity of the area of hull projecting into the river, it was reasoned that the wood not revealed to the light, or to the flow of oxygenated water, would be even less affected by biochemical deterioration.

The effects of the weight of several tons of concrete blocks, and healthy growing willows, on top of the hull which in theory remained under the bank, could not be fully assessed. It appeared

that the hull had split to some extent, the southern side gunwhale being lower and at an angle to the northern side gunwhale.

The report to the Norfolk Keel Recovery Action Group suggested that if the hull were to be recovered, it were best done in the near future, before river traffic, erosion, and natural growth caused the hull remains to deteriorate beyond the point of the evident remaining structural integrity.

Decision to Excavate

Following the initial survey, members of various concerned bodies came together to discuss whether the hull at Whitlingham could be surveyed or recovered. There were little or no public funds available, the Norfolk Keel Recovery Action Group had no great source of finances, and there were no private individuals with the sums necessary. The members asked for estimates from salvage and engineering companies, for costs to uncover the hull. These estimates varied from £40,000 to £100,000 to uncover the vessel. There were no public funds available.

Investigation also revealed further threats: the navigation authorities suggested that the keel remains projecting into the river channel needed to be removed, as a hazard to navigation. Plans for a new southern bypass to the city of Norwich also indicated that the area at Whitlingham would be subject to major developments, in process of which the hull cold be destroyed. The Norfolk keel remains had quite quickly become a question of immediate rescue excavation if they were to survive or be recorded.

Consequently I chose to examine the evidence to support the

proposal that this was indeed a Norfolk keel, and as such, of value to knowledge of inland waterborne traffic types. Lack of documentary evidence suggested that a study of the keel would be informative, there being no published details apart from newspaper reports or earlier local interest travelogues, and two evidently divergent boat models with little internal structural detail.

Enquiries to private companies and voluntary groups allowed the possibility of a low budget excavation to uncover and to record the Norfolk keel. Local plans for preserving nautical heritage material in Norfolk also encouraged the uncovering of the vessel to determine its nature, and make a full record of it. A group of individuals came together to make efforts to raise funds in order to detail the Norfolk keel.

The Norfolk Keel Trust was formed from six members of the interested groups: two local boat hire businessmen, a Broads Authority officer, a Naval Architect, an engineer, and myself as the Director and Archaeologist concerned. The Anglian Water Authority gave permission to examine and to excavate the site.

All equipment was gained by free loan from local and national companies. Finance came through public appeal.

Strategy

Through the nature of the Whitlingham keel's position, the initial choice had to be made either to dam the area surrounding the hull, and treat it as a dry land excavation, or remove the overburden, and excavate the site by underwater methodology.

The Yare valley is banked a great deal to prevent flooding.

High water levels make it an expensive and difficult operation to drain off any area.

The Whitlingham site not only was surrounded by water on three sides - river to the east, a small silted channel to the north, and an enclosed deepwater pool to the west - the bank itself is effectively present only through intervention in the form of utilising sunken hulls, gravel, brick and rubbish inlaying. This meant that if drained, the bank area would effectively become unstable.

Added to the difficulties in draining the site, the Yare is still a main channel for waterborne traffic to Norwich. Any structures extending further into the river channel would cause a hazard to shipping.

The decision was made to uncover the keel by removing the bank overburden, then proceed by underwater excavation techniques. In the first instance, site protection and integrity had to be ensured. The Anglian Water Authority agreed to allow limited land access to members of the team, through security gates and along a rough track. The River Inspectorate agreed to protect the site by discouraging holiday traffic from the immediate area and to advise of any interference. The site was further cordoned off by red tapes strung between standing poles above high water level, which would not damage any river craft that they came into contact with, but would warn traffic of hazards. Warning signs were also placed up and down river of the site.

Overburden

Overburden trees were removed with chainsaws to trunk base level, roots left until clearance allowed investigation as to the extent of their encroachment on the keel hull. Several concrete blocks, weighing approximately 1 ton each were removed by means of winches and temporary overhead supports. Bank overburden was removed to approximately 1 metre above water level by means of earth moving equipment.

Beyond the bow of the Harold Margetts Thames barge is the enclosed pool, formerly a docking and loading facility for wherries servicing the Whitlingham waste disposal area or Postwick brick works. This had remained accessible to boat traffic in succeeding years, but was not considered a safe area. The Harold Margetts had been used to plug the access to the pool which had consequently silted up. This arrangement proved hazardous both in terms of bacteria content and access to the Harold Margetts. Any volunteers working near to the pool had to be assisted by "roped diver" practice. All volunteers were required to have preventative vaccinations. Water flow into the pool at high water returned with the drop in tide to further silt and obscure working conditions around the keel hull during later stages of underwater excavation.

Once overburden had been cleared to near water level, it became necessary to determine whether the hull of the Harold Margetts was resting on the keel hull on the landward side. Wooden bank posts, contemporary to the sinking of the keel as a bank support, were surveyed into an overall plan. The Harold Margetts was photographed and detailed by team members and an invited guest,

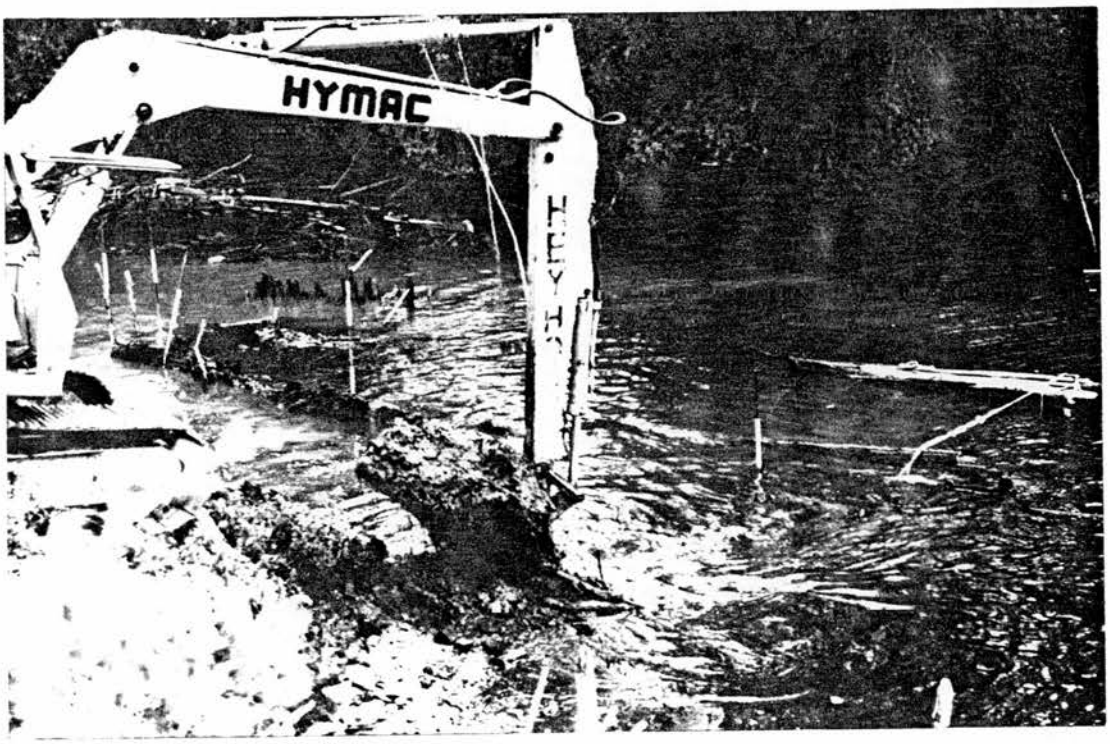
secretary to The Society for Spritsail Barge Research, Mr Richard Smith. Mr Smith informed us that there was no distinct requirement for the preservation of the stern section of the Harold Margetts as this was beyond a restoration condition, and also other better preserved examples were available.

The port stern quarter of the Harold Margetts was removed to water level. This revealed that the bank support posts had wedged between the two vessels, effectively spreading the weight of the Harold Margetts where it pressed down upon the stern port quarter of the keel.

Bank overburden to water level was removed by excavator (Plate 54) and by hand at times of extreme low water. A volunteer team making a chain with buckets and spades allowed careful removal of soil deposits to the uppermost level of clinkered waste over the hull (Plates 55, 56). This process was discontinued once low water made working conditions unsuitable for such land excavation techniques.

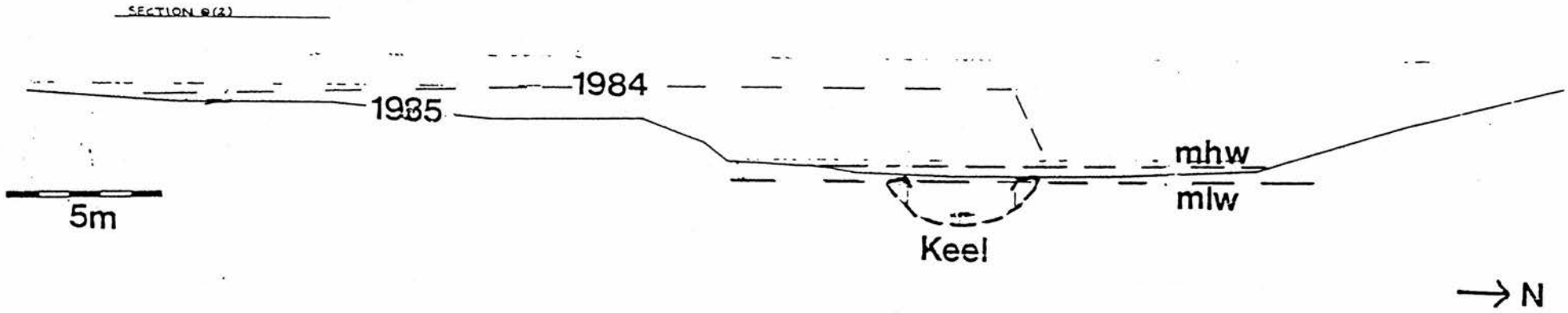
Underwater Excavation

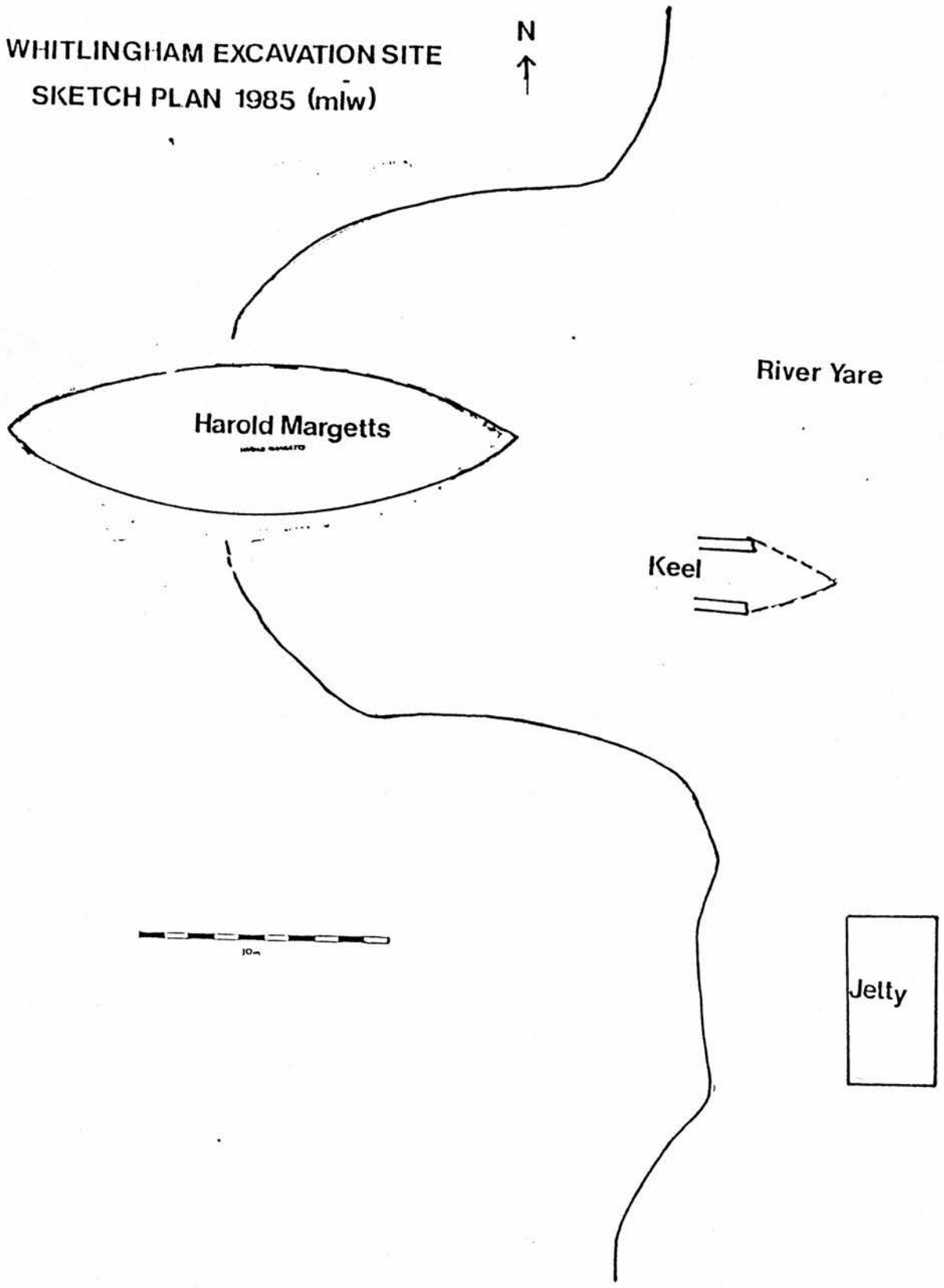
General excavation procedure of the hull underwater was dictated by two major concerns. Firstly, would the higher bank on the starboard (south) side be liable to slipping, as deeper excavation made the slope more abrupt and therefore less supported? Secondly, the outline (broad plan) of the vessel suggested that the stern was down to a lower level than the broken bow section, also that she had suffered some collapse on the port side - would an excavation by section, on an advancing vertical front, cause further



54

WHITLINGHAM EXCAVATION SITE - SECTION SKETCH (Not to scale)




WHITLINGHAM EXCAVATION SITE
SKETCH PLAN 1985 (mlw)
N
River Yare
Harold Margetts
Keel
Jetty

56

structural collapse? Weight had been evenly distributed over the hull before excavation. Weight removed unevenly might cause further strain.

It was decided to uncover the hull on a long sloping front, allowing the weight to gradually reduce as the centre of gravity of the infill neared the stern. To avoid any possible slippage of the bank to the south, an earth remover was again used to make this a long gradual descent to water level.

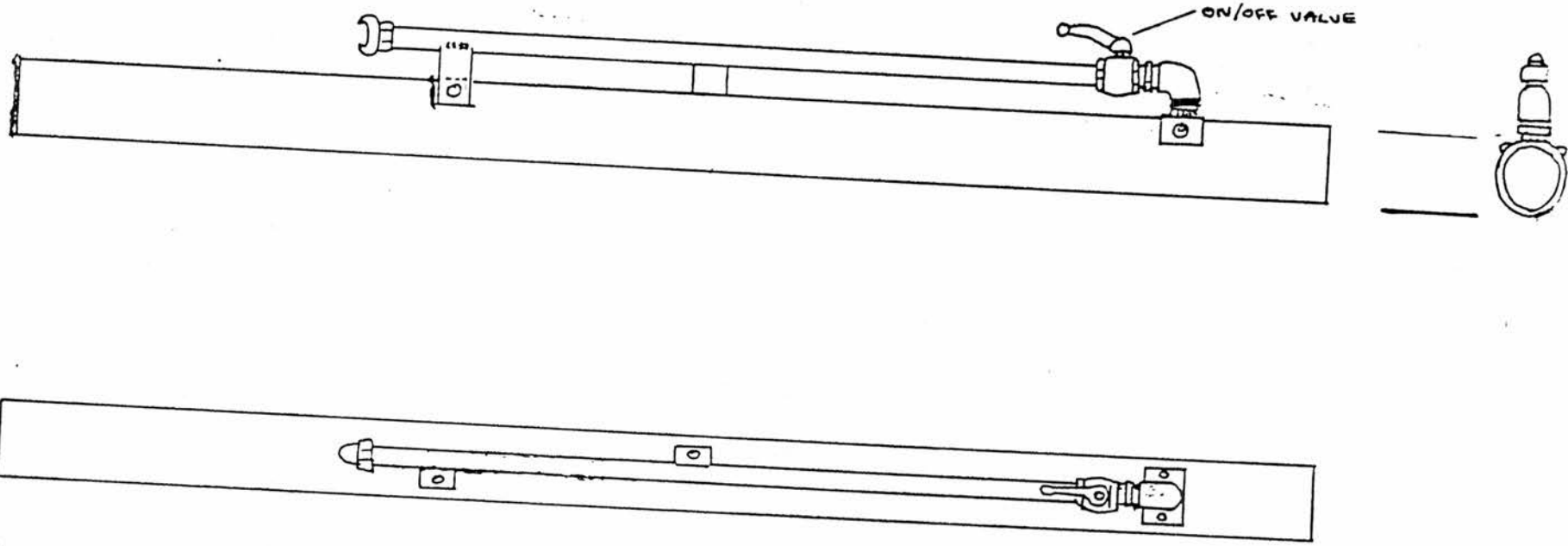
The removal of the stern section of the Harold Margetts, and removal of topsoil, revealed the general outline of the riverbank as formed in the 1890s when the hull was deposited. To reveal the full extent of the hull, it became necessary to utilise pneumatic and water jet equipment to remove overburden below water level.

The top layer of material deposited on and within the keel hull was an extremely strong, concreted layer of clinker. This had effectively made a seal over the greater part of the hull. To remove this, air lances were employed to break up sections of the clinker. A powerful water suction pump dredge (Plate 57) acted to remove heavier material at higher levels. Air dredges (Plate 58) powered by road compressor allowed more careful removal of detritus as wood areas became revealed.

Visual and tactile inspection of the port (northern) side of the keel hull where silt allowed inspection to a depth of approximately one metre from the top of the side deck revealed that the carvel and clinker strakes were in remarkably good order. Beam measurements suggested however that there had been some flattening out of the vessel amidships. It was therefore decided that side supports must be introduced for diver safety. A 1-2 metre wide

57

Scale 1:10

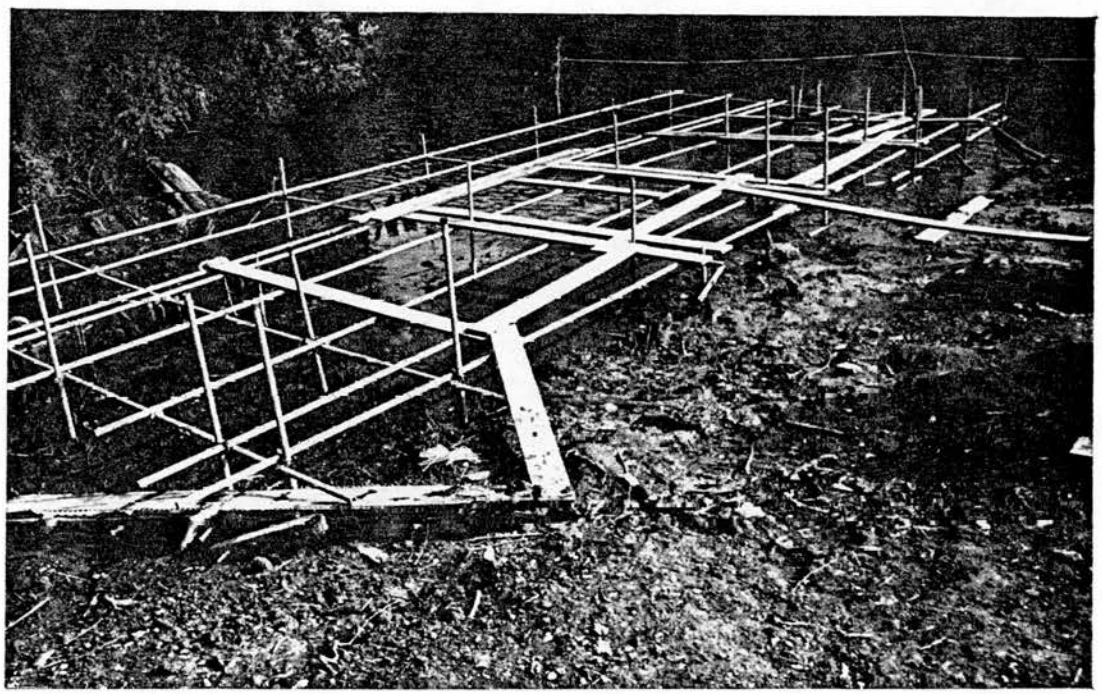


Tube : ABS
11·25cm diameter
1·5 cm wall thickness
198 cm length overall
Air Pipe : 2 cm diameter
125 cm length
Galvanised ball type valve,
Brackets & Plate: 2mm mild steel
Boits & Nuts: 2·5cm x 8mm

channel was dredged around the sides of the hull at an equivalent level to detritus removal inside the hull, allowing movement of team members.

As excavation proceeded, various problems in dealing with a low to blind visibility environment in a rstricted working space had to be overcome. Initial stages of detritus removal allowed volunteers to work in wetsuits with buoyancy jackets but without breathing apparatus. As working level deepened, it became necessary to use brething appartus. Partners could not communicate easily except by touch, and such close working could be dangerous when using pneumatic equipment. Consequently a framework of scaffolding was erected over the site overlaid at some points with boards (Plates 59, 60). This allowed quick and easy access to any point over the hull. It also allowed diving partners to work in turn - as one sat in kit on the overhead, clearing lines to air lance, air lift, or dredge, or handling roped diver, his partner, within close reach could signal to him. The engineer or an appointed equipment supervisor could turn off power at source on signal from above water partner if necessary. When not using powered equipment, partners worked together underwater as normal sub aqua practice. This method proved very safe and effective, and allowed a very relaxed working atmosphere for participants.

Once the outlines of the hull had been revealed, and detritus had been cleared to a depth of approximately 50 centimetres within the hull, it was possible to further assess the structural integrity of the hull. The bow planking had sprung as far back as the forward section of the hold. The stern planking had sprung away from the



59

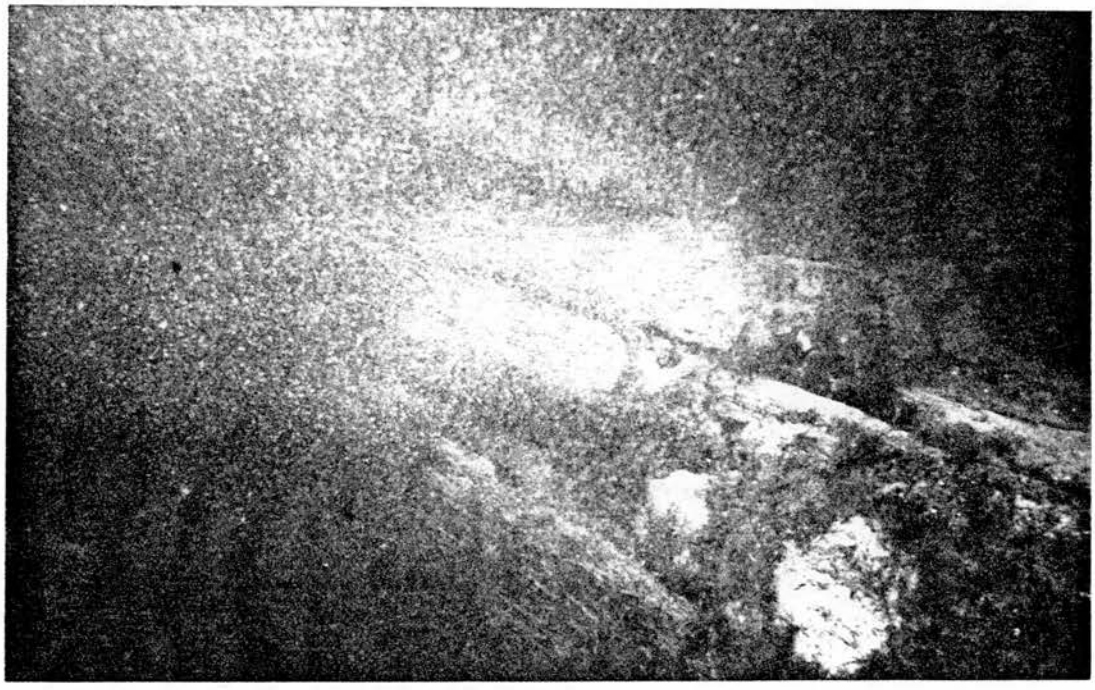
60

transom to a distance of approximately 2 metres along the length of the hull. A further possible problem was suggested - was the remaining infill effectively acting to prevent the mid section from springing open also?

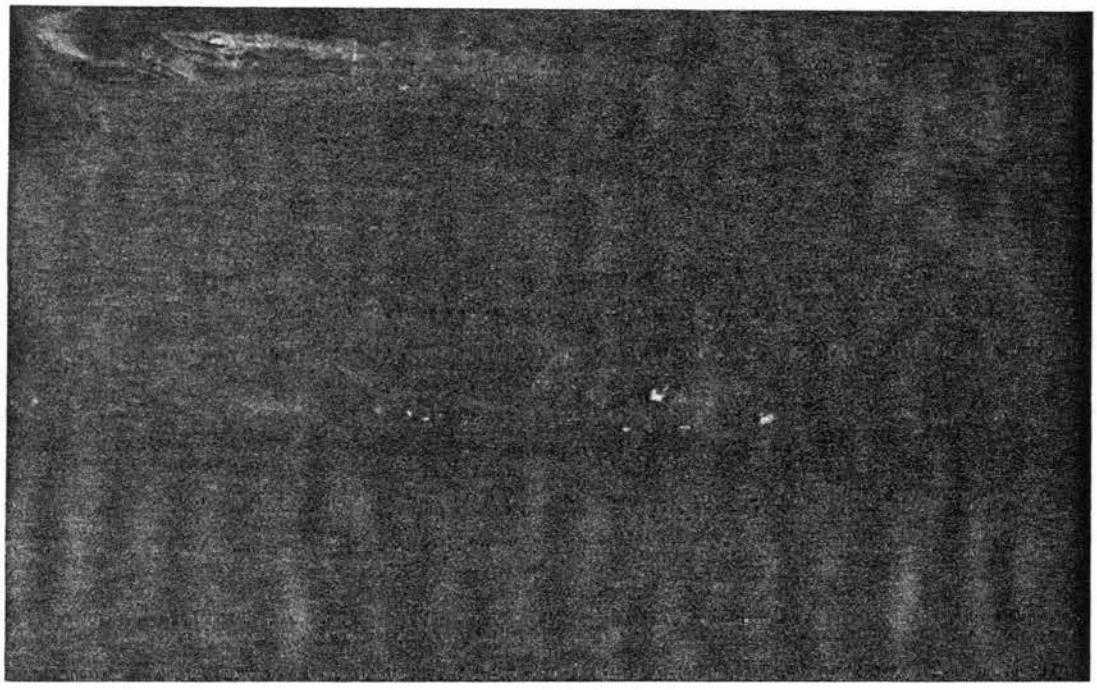
Inspection of the hull at this stage via underwater camera allowed more detailed visual assessment. Where normal eye inspection was restricted by the high level of silt suspended in the water, the camera system allowed otherwise invisible detail to be seen - the divers controlling the camera i self considered themselves to be blind diving, whilst those at the video screen had a clear view (Plates 61, 62). This inspection revealed that not only had the planking moved slightly open amidships, but that bolts and nails fixing these planks had been affected by their slightly saline environment. The structure needed further support.

To provide structural support for the hull, a ring and brace system was introduced. Air lances and suction dredge were used to excavate narrow channels under the hull through which wire could be fed. The wires were then used to draw through cloth covered steel strops, which were then tied around the hull using screw and slip with locking pins. Internal bracing was introduced at the same point as these rings, and tension adjusted on the strops to allow the hull to be both braced and tied in. Small wood blocks were used at salient points to prevent rubbing on the wood structure of the hull itself.

Excavation continued until the hull was fully revealed. The hull was sunk not by holing the underside, but by overweighting her until she could no longer remain afloat. She was initially filled with brick, then further with gravel and general waste, finally with



61



62

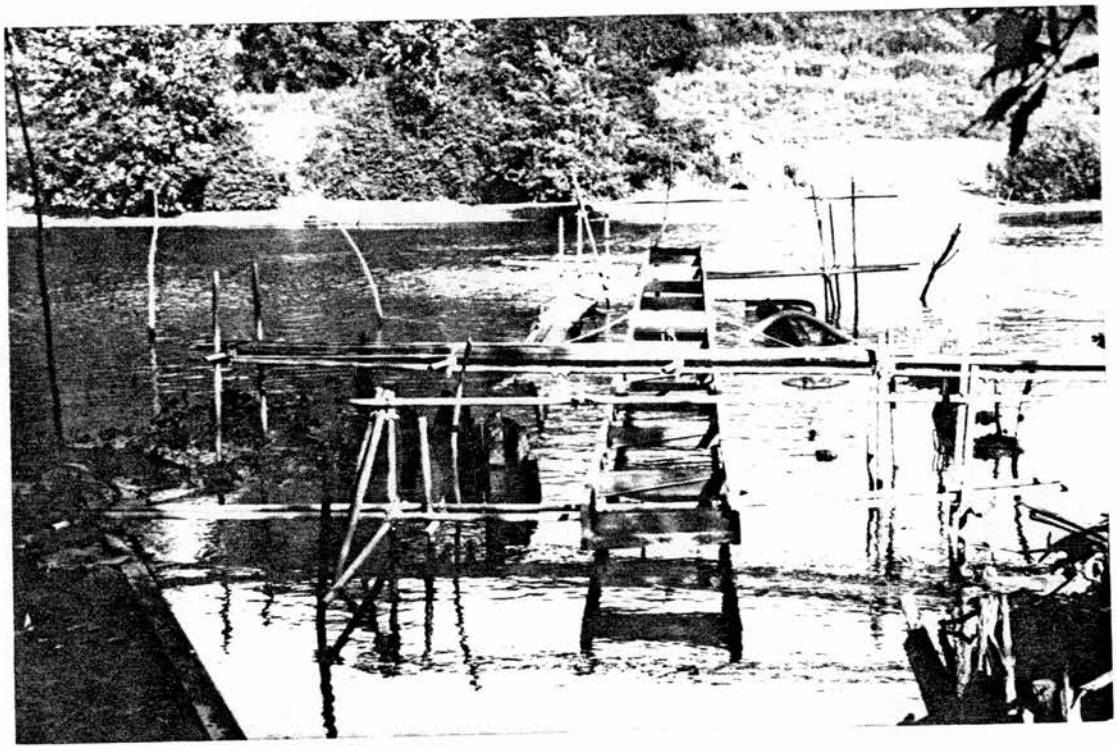
coal clinker. Over this the bank was built up with soil.

The degree and areas of deterioration of the fully oak-built keel when she was fully uncovered proved to be almost the reverse of that expected from the initial survey and excavation stage. Whereas the bow section, which had been revealed to light and oxygenated water, remained very firm, some oak fittings inside the hull appeared progressively more deteriorated towards the stern. The majority of the hull that had been covered by the bank remained remarkably sound and whole. Deck planking within the hold, side planking and visible forward frames were in good general condition. However, the stern frames to the rear of the hold area, forward and stern transverse and upright knees, also to a lesser extent the stern transom, were visibly more affected by the conditions. The areas most affected appeared to be those which have been taken from naturally growing shaped wood.

Loose planks and bin iron sections were detailed and removed for storage, further cross bracing with rings introduced as appropriate. Longitudinal bracing was provided by an overhead steel bridge, with upright bracing, to prevent hogging (Plate 63).

Removal and lifting operation

Whilst volunteers had been uncovering the Whitlingham keel, the Norfolk Keel Trust Trustees had considered its future. Three alternatives were considered: To detail the hull, and then to reinstate the river bank following the destruction of the forward section so that it was no longer a hazard to river traffic; to remove the hull to another underwater location, where she would



63

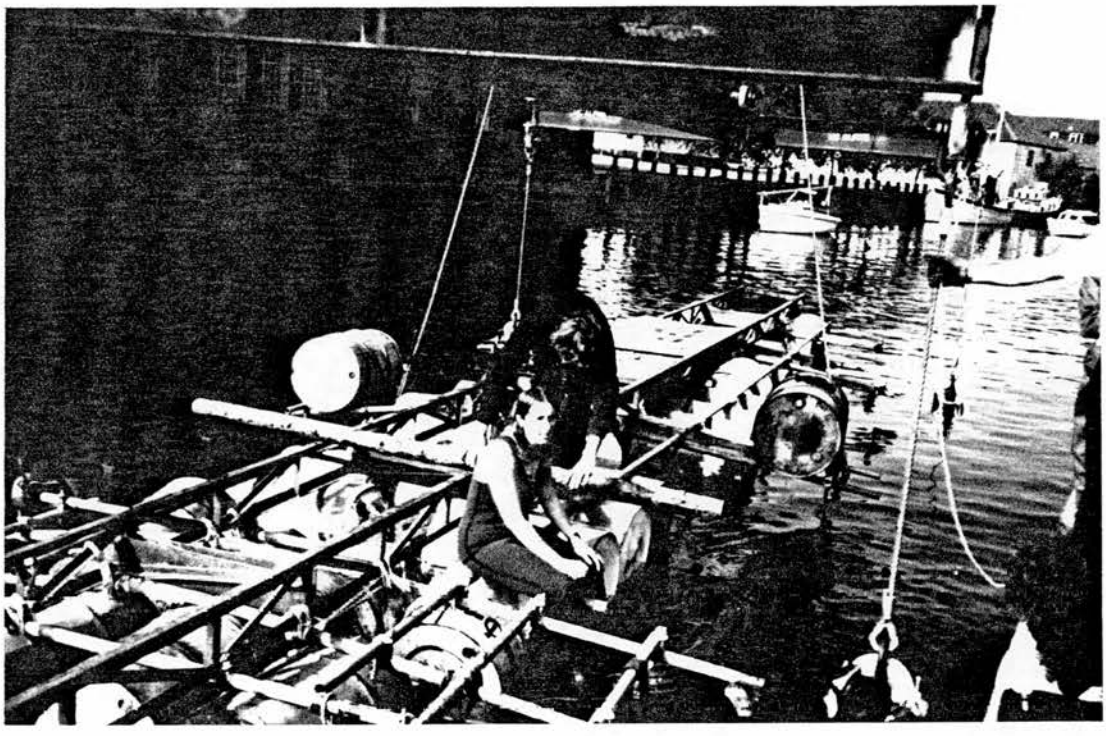
not be a navigation hazard, and to there cover her with silt and debris so that she was protected from light and manmade interference; to life the hull and instigate a conservation procedure so that she might become a museum display piece.

The Trustees were informed that a move within the Broads Authority towards establishing a Boat Museum for the Broads would provide a future home for the keel. The Community Programme scheme for the county of Norfolk agreed to assist with labour and costs in a conservation project for the keel. The Anglian Water Authority agreed to gift the keel over to The Norfolk Keel Trust. It was consequently decided that she be lifted and removed to a site on land, there to be housed in a high humidity environment.

Lifting procedure

The strops, braces and bridge provided the keel hull with structural integrity. In order to lift the hull from her site it was necessary to introduce buoyancy by means of 48 sealed steel drums each having a 40 gallon capacity, allowing a maximum of 400lb lift per drum. A safe working limit of 325lb lift per drum was allowed for, giving 15,600 lbs or approximately 7 tons lift. These were attached to the bridge by a cross framework of scaffolding (Plate 64).

Following the full attachment of buoyancy aids at low water the hull's removal from the bank was achieved by utilising the natural rise of the tide. Air jets were used to break the suction effect of the mud-bed underlying the keel. As the tide came up, and the buoyant structure floated, a small work boat was used to tow her



64

out from the river bank. She was then taken downstream to the Woods End public house mooring opposite Postwick Marshes where she was moored overnight. Divers checked and secured strops and braces, and inspected the underside of the hull, finding no loose timbers.

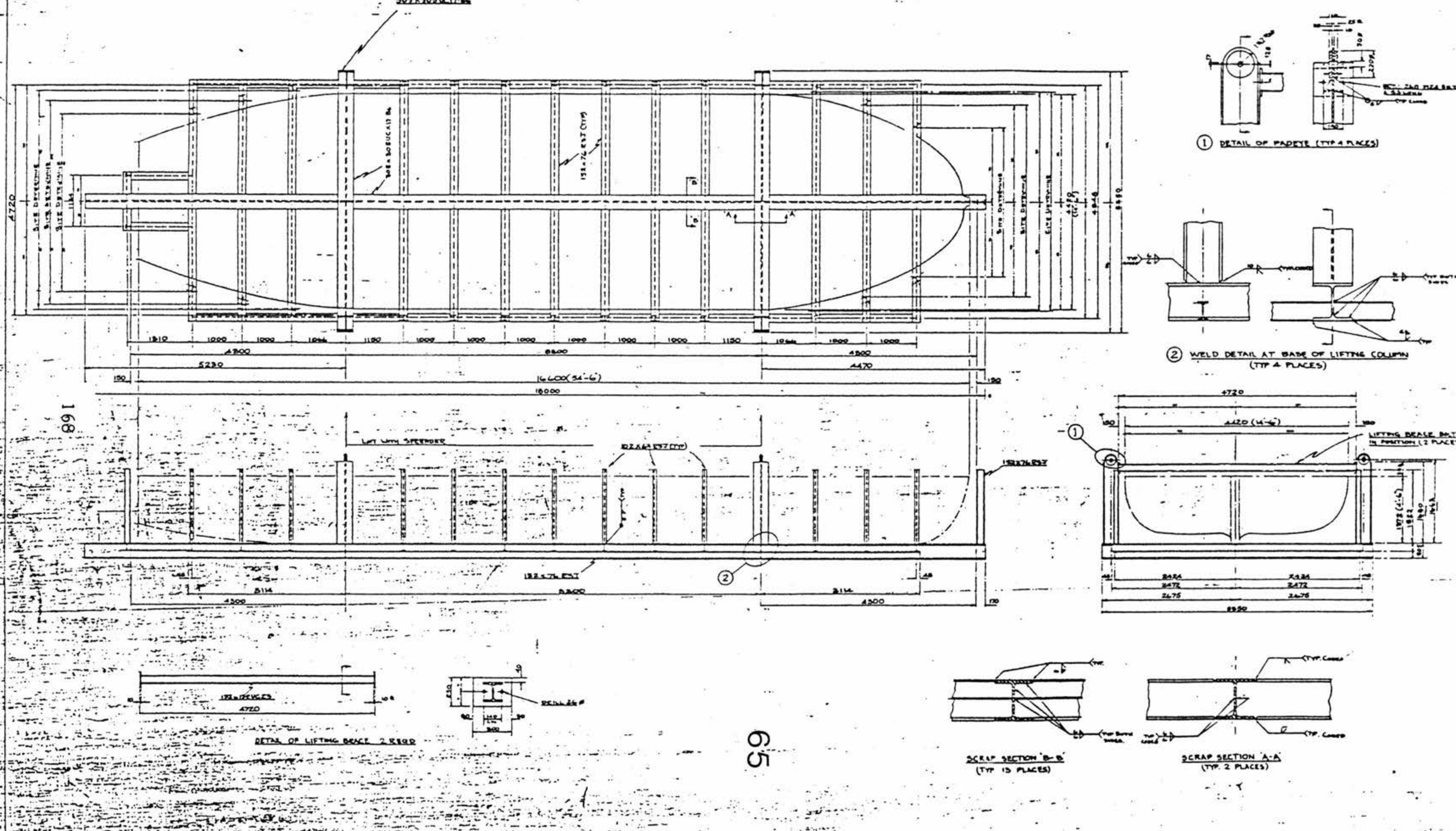
On September 29th 1985, the Whitlingham keel was towed along the Yare into the city of Norwich. At Corporation Quay, lifting team and equipment were already in place.

The keel was towed over a steel cradle (Plate 65) which was suspended by crane at an appropriate under-water level. Once the cradle was lifted to take the weight of the hull, the overhead bridge and buoyancy was detached and floated off. Chocking and supports within the cradle, also the ring and brace system around the hull, were adjusted in stages as the cradle was lifted (Plate 66). To lift the cradle, a large mobile crane supported lines to an H-spreader beam, which in turn supported lines to support uprights on the cradle itself (Plate 67, 68).

The Whitlingham keel was transported by low loader to Hales Hall near Loddon, Norfolk (Plate 69). A framed plastic building was erected over the keel, in her cradle, and a recirculating water pump system installed to spray the wood and thereby prevent dehydration (Plate 1).

The Uncovered Whitlingham Keel

Plates 70 and 71 represent a reconstruction of the Whitlingham keel hull. The shape is described as the strakes could be placed if fixed in position at the transom stern and to a theoretical raked



168

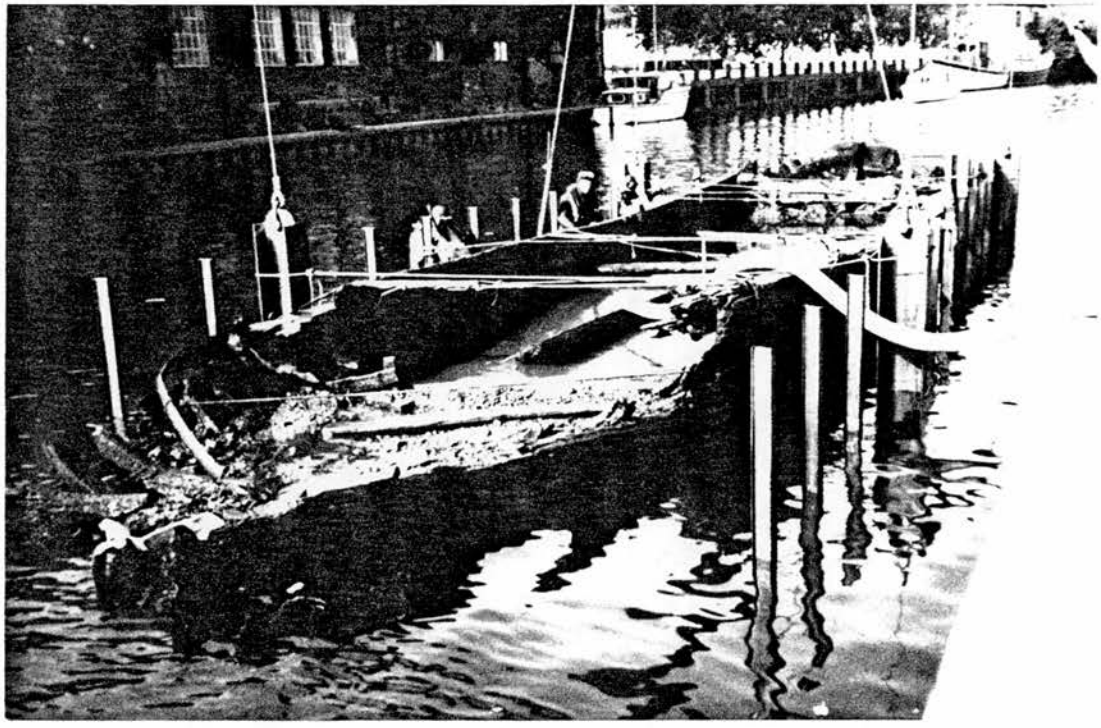
65

MATERIAL TO BS 4360 GR 43A OR GR 50A ACCORDING TO AVAILABILITY

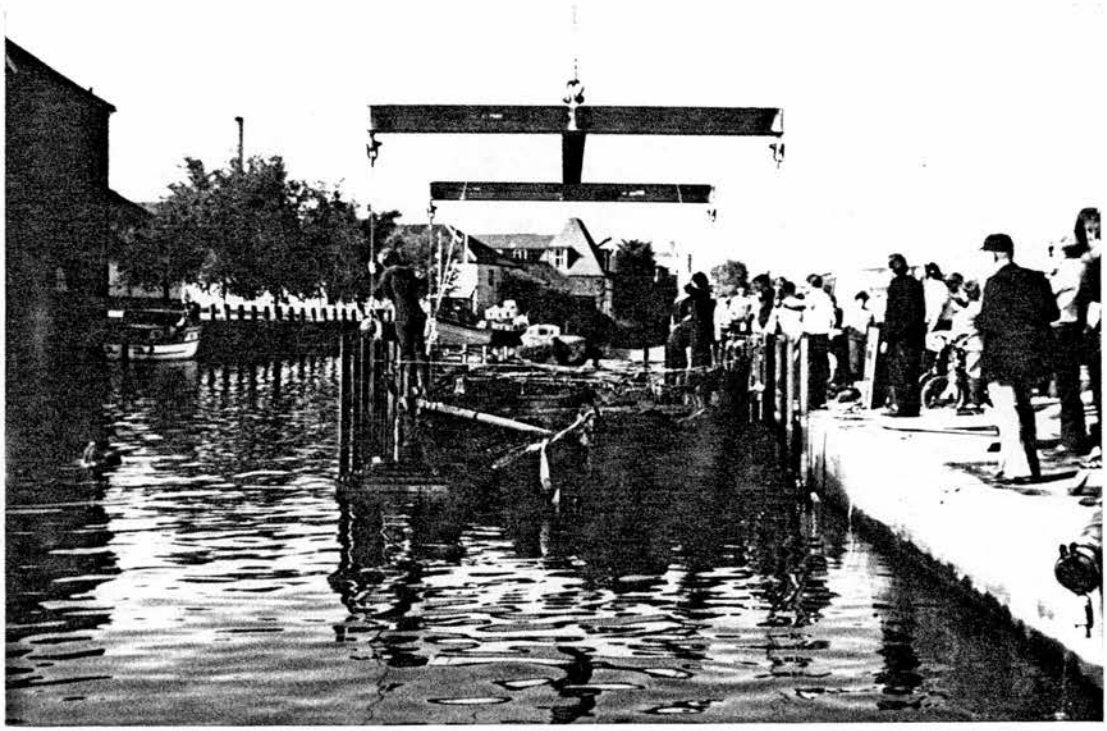
0 ISSUED FOR APPROVAL

McALPINE-HUMBEROAK LIMITED, THE PRECINCT, HIGH ST., GORLESTON-ON-SEA, GT. YARMOUTH, NORFOLK.

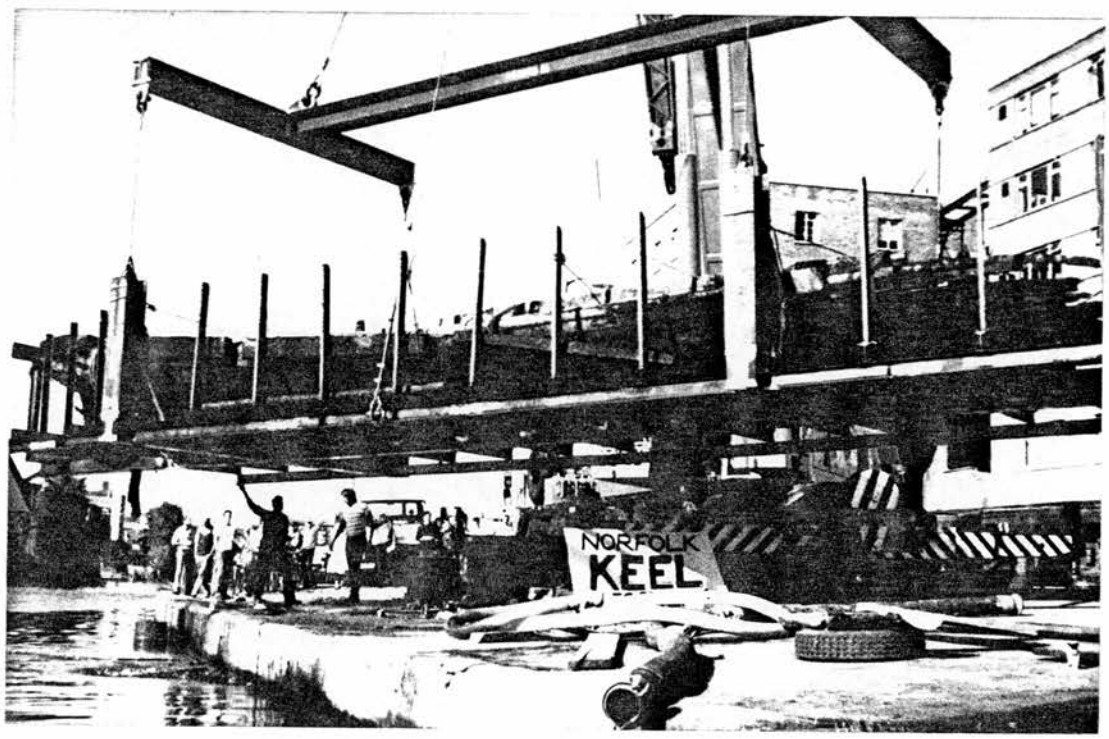
TITLE LIFTING & SUPPORT FRAME FOR THE NORFOLK KEEL



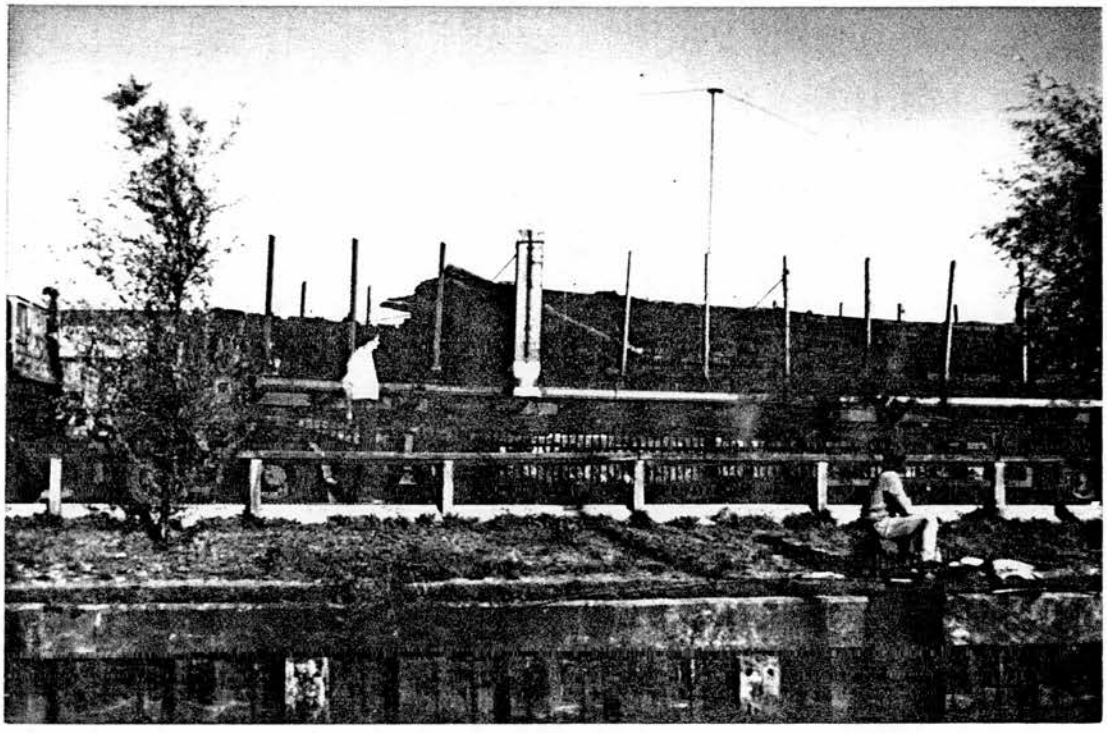
66



67



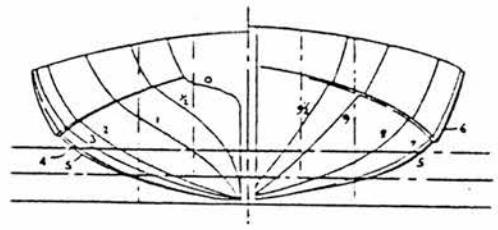
68

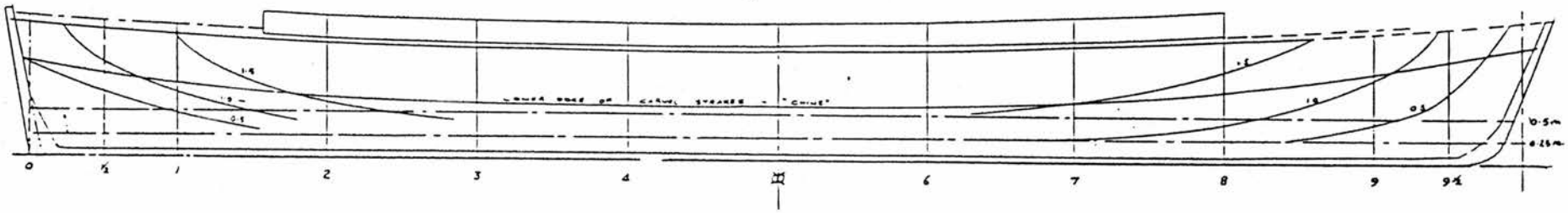


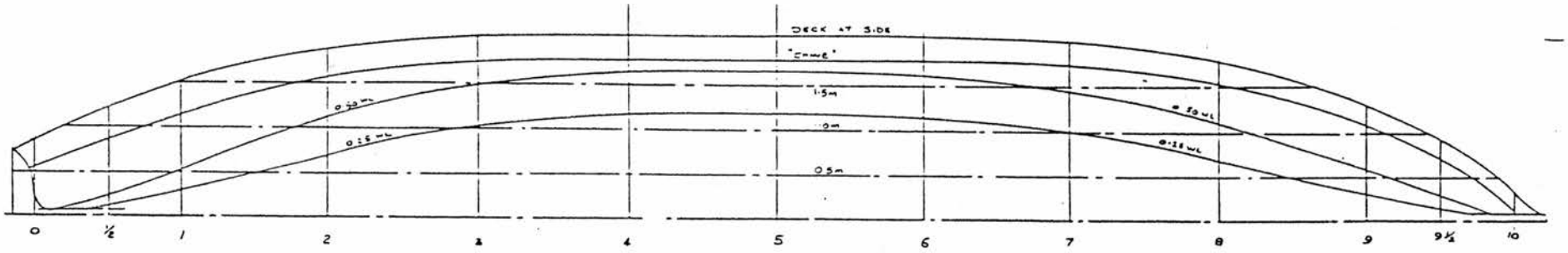
69

WHITLINGHAM KEEL

70







WHITLINGHAM KEEL

LINES PLAN

71

shape at the stem.

Dimensions of the Whitlingham keel:

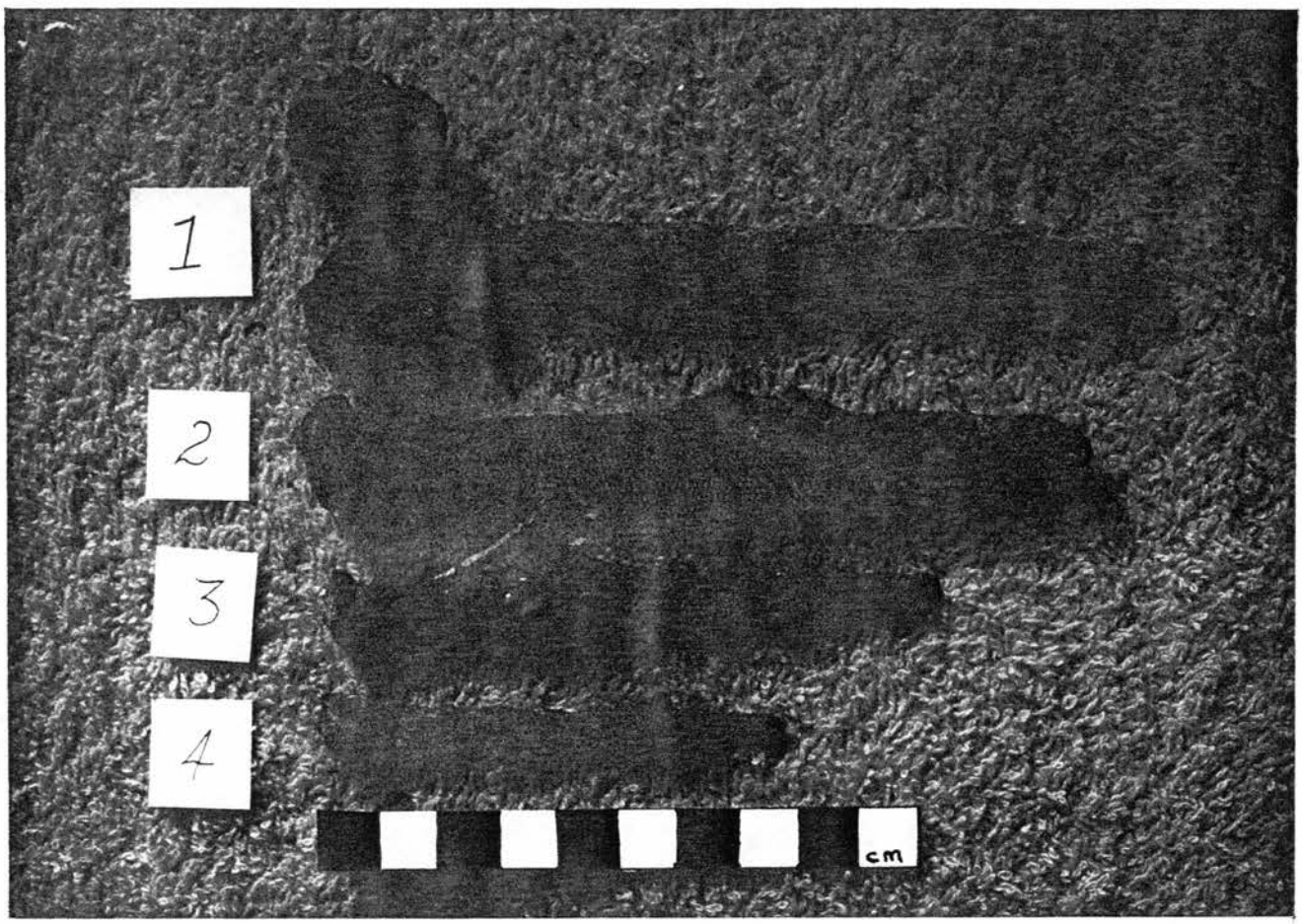
Length overall	55ft	9ins	or	16.99m
Fore beam (12ins or 30cm from bow)	11ft	8ins	or	3.55m
Beam amidships	13ft	8ins	or	4.03m
After beam (8ft or 2m from stern)	11ft		or	3.35m
Estimated length of stem	5ft	5ins	or	1.65m
Length of sternpost	5ft	4ins	or	1.62m
Depth at after beam	5ft	10ins	or	1.47m
Depth amidships	4ft		or	1.22m

The Whitlingham keel is built principally of oak. Fixings include iron bolts, clenched nails and straight forged nails (Plate 72). The keel, stem and sternpost, frames and deadwood are all oak. The frames and timbers appear in some instances to have been made from naturally grown crooks of oak.

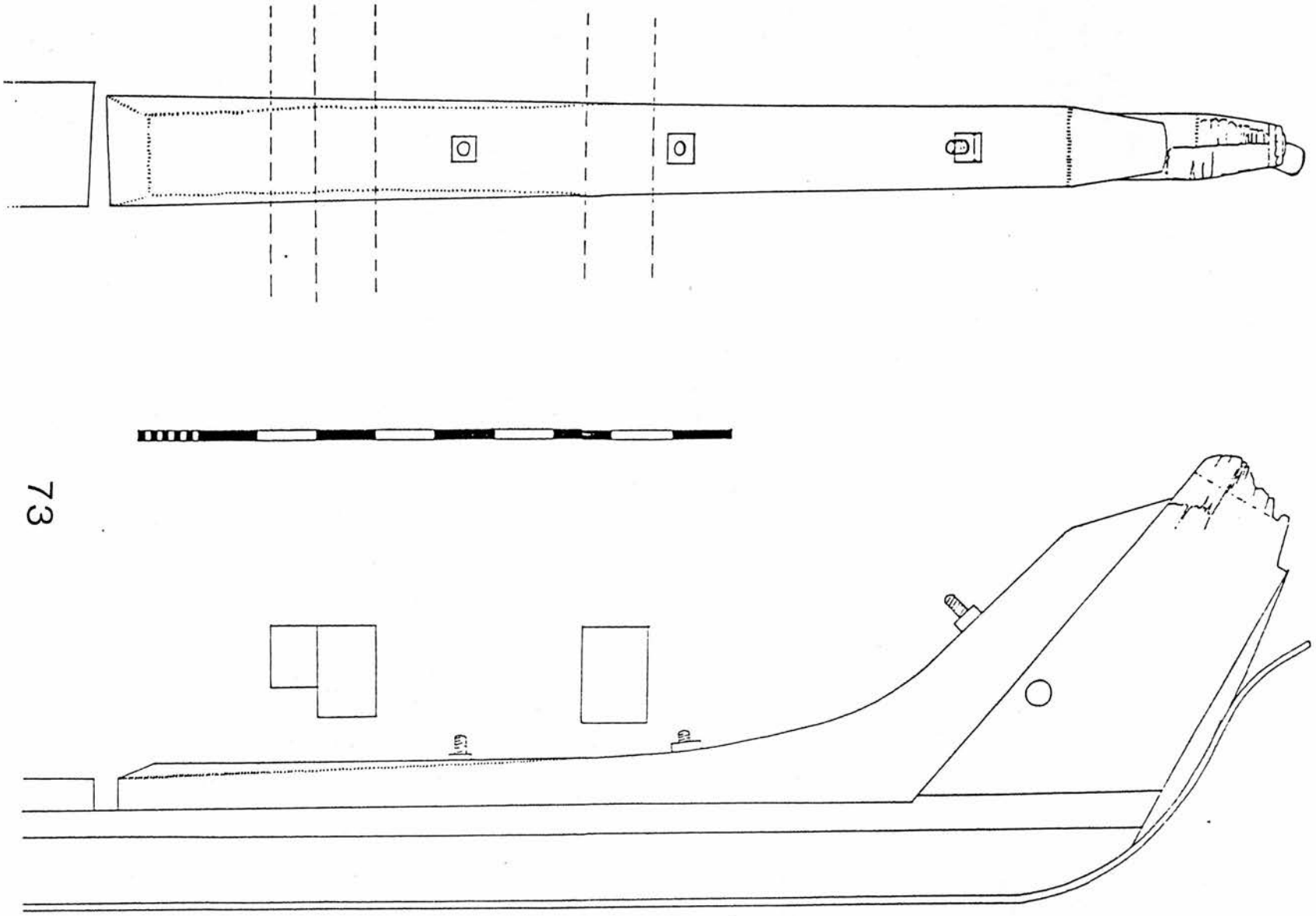
The keel is 16.3m long, by 8cm wide, 11cm depth. The hog is 11.99m long, by 21.5cm wide, by 5.5cm depth. A rubbing iron also runs below the keel from the base of the stem to the base of of the stern post.

Little remains of the stem post. The broken end extends to 89cm above the keel (Plates 73, 74). The grain of the wood in the stem is much in line with the shape of the stem. The knee at the bow is 14cm wide forward tapering to 7.5cm width at the stem post. The stem is pierced by a hole which is 4.2cm in diameter at approximately 30cm above the keel line, outside the planking and below the waterline. This may have been used when drawing the hull out of the water for maintenance (Plates 75, 76).

The stern post is 1.62m high, 6cm at the top tapering to 12.9cm at keel (Plates 77, 78, 790. It is notched to receive the

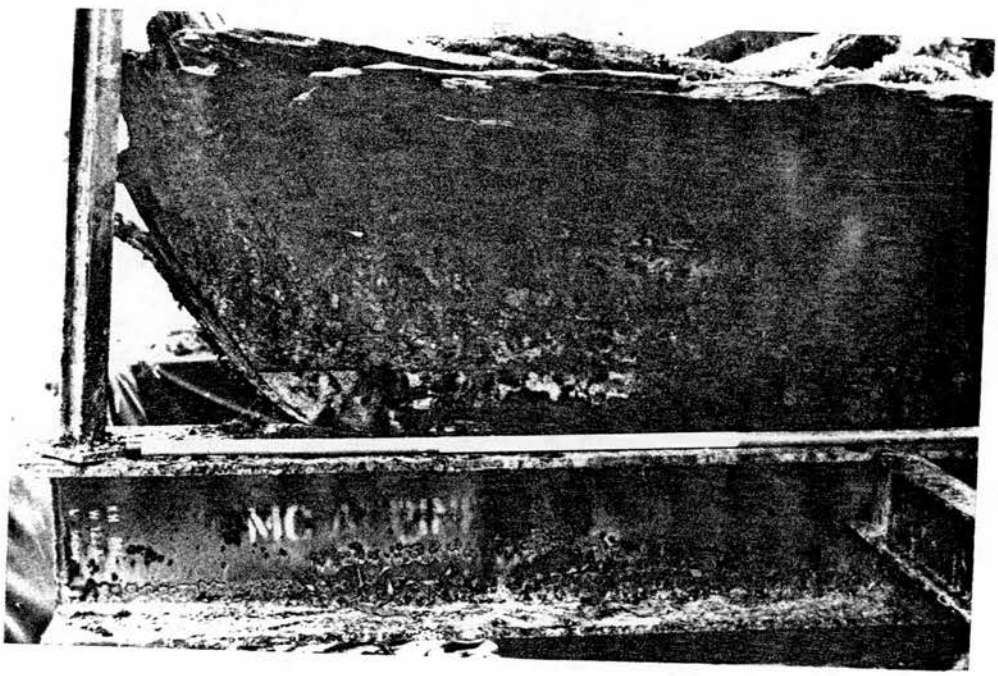


72



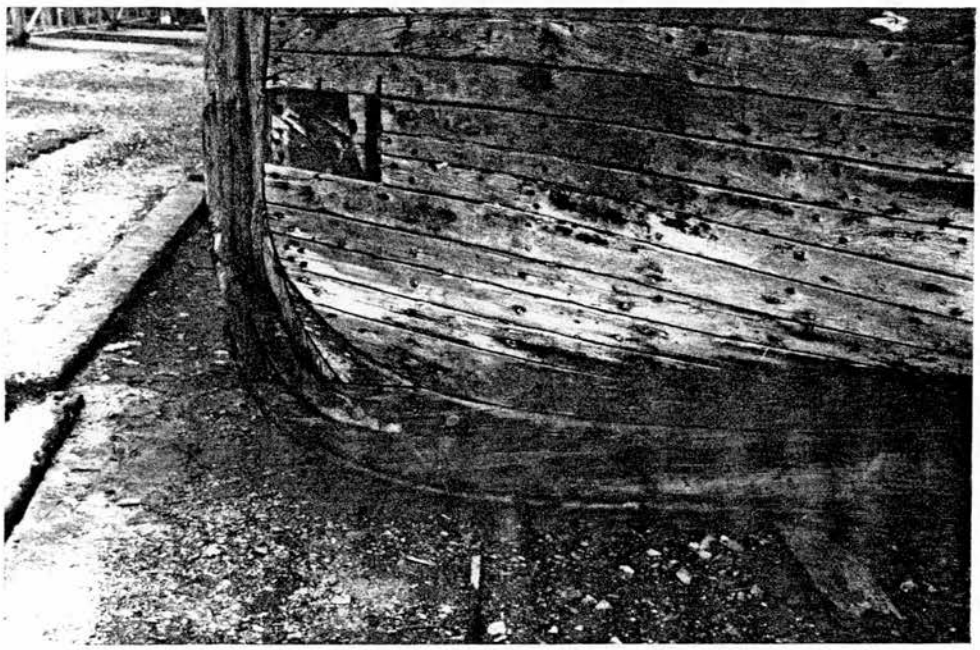
73

WHITLINGHAM KEEL — BOW SECTION



74

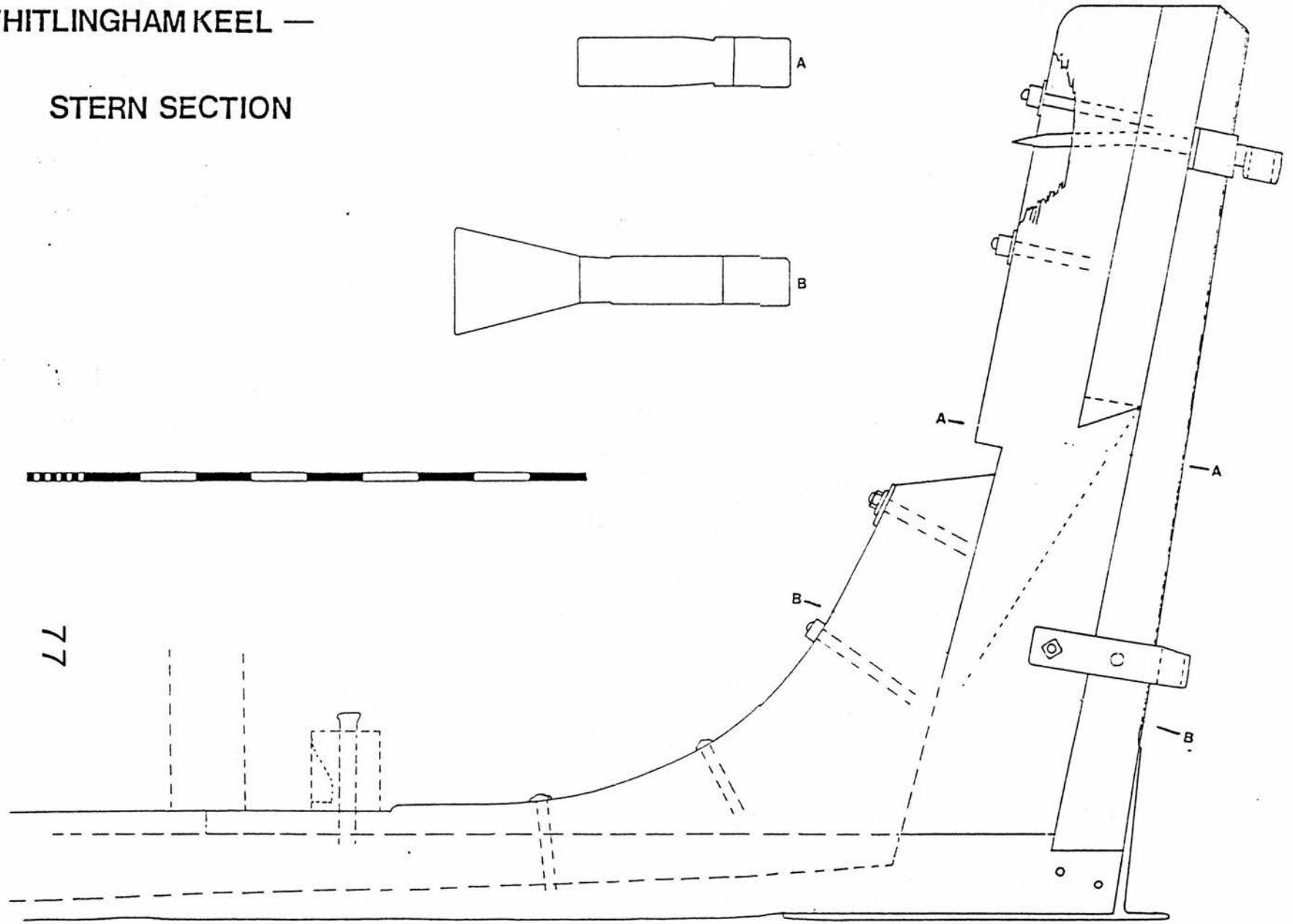
75

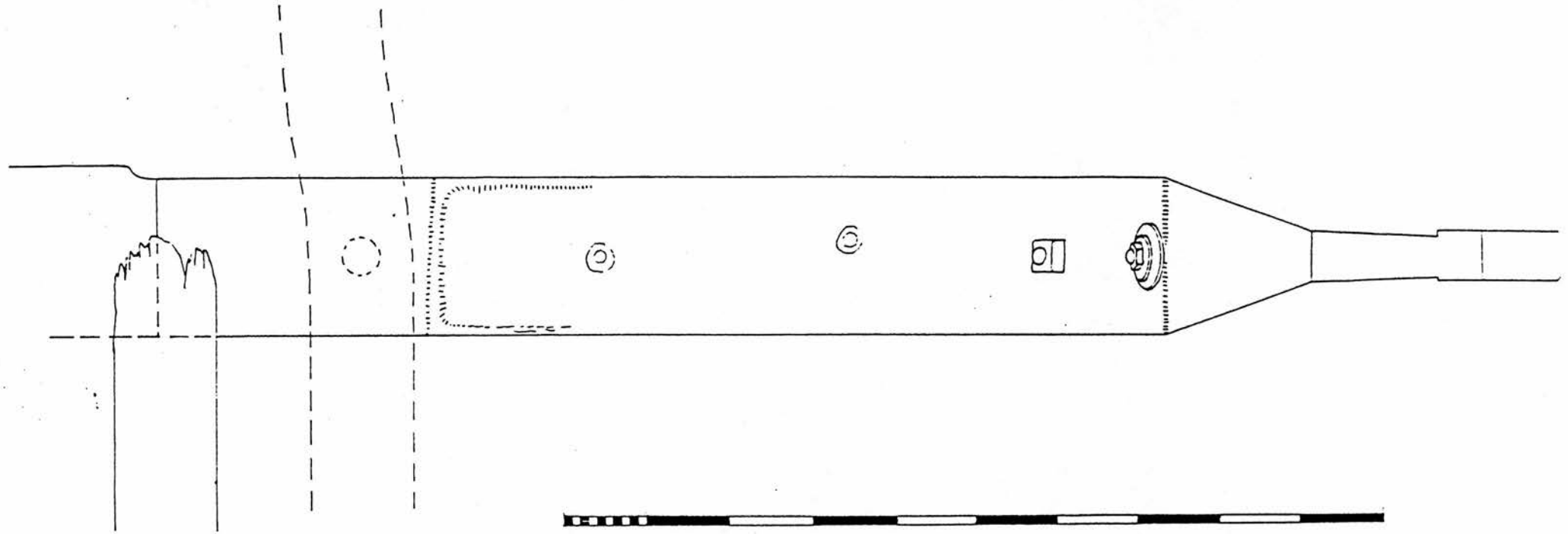


76

WHITLINGHAM KEEL —

STERN SECTION

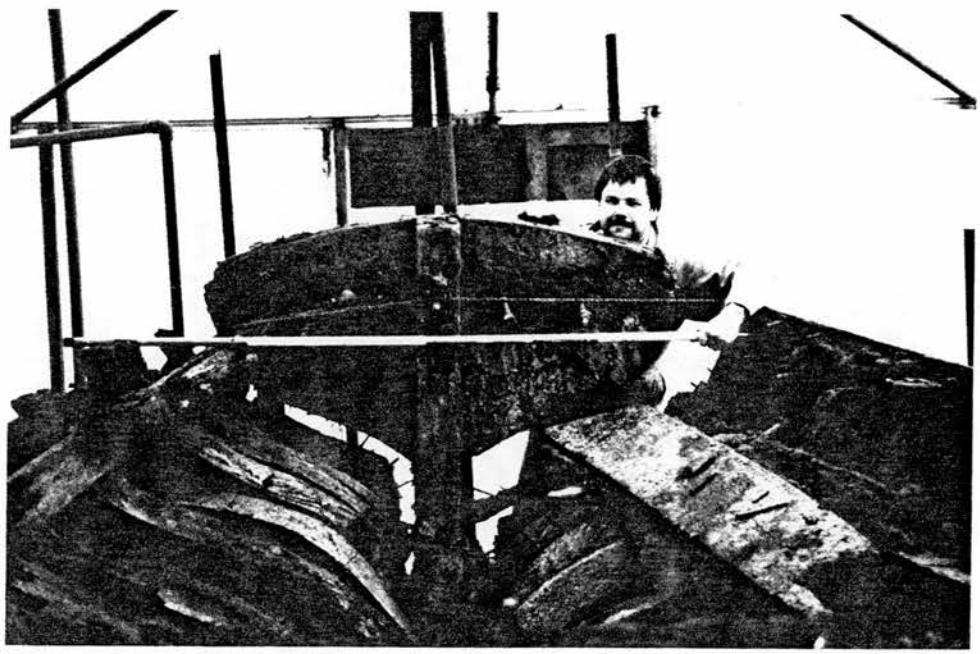




182

WHITLINGHAM KEEL — STERN SECTION

78



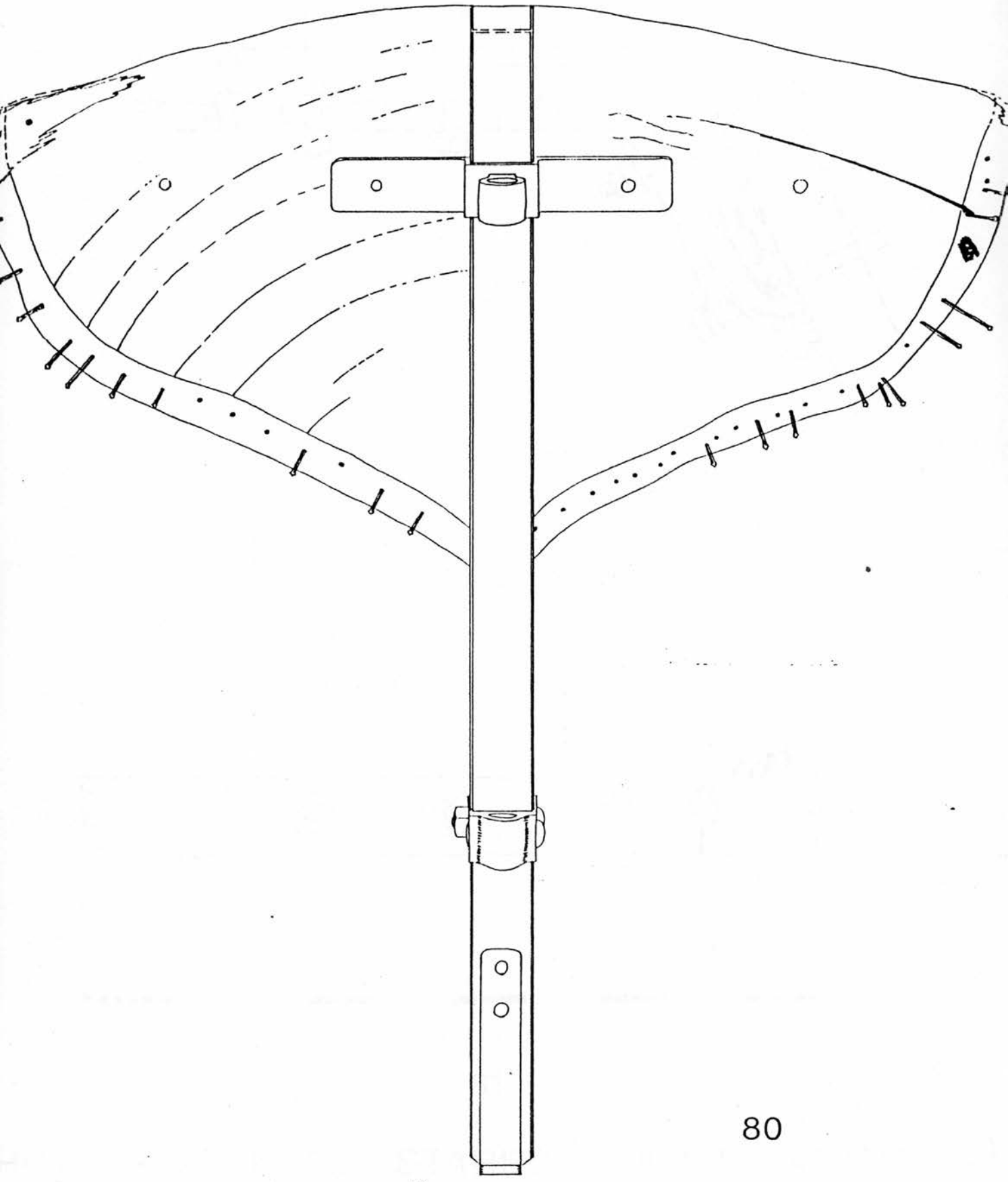
79

transom, which appears to be cut of a single piece of oak, the grain radiating from the centre point nearest the sternpost (Plate 80). The transom is 150.5cm at its widest point, 73cm at its highest point, and is 10cm deep. The transom does not bear a rabbet line to receive the strakes, but is bevelled on its outer edge. The quarter knees bracketing the transom stern to the gunwhales are 83cm long by 46cm at their widest point, tapering to 15cm depth (Plate 81). Four bolts pierce the quarter knees and continue into the frames on the side, further bolts pierce the transom stern aft. Two metal plats shaped to the stern post at 59cm and at 147.5cm height from the keel carry rings 6.5cm and 6.4cm outside diameter, which stand out - these would have accepted a bar or hooks attached to the rudder. The transom knee is 22.2cm deep by 8.6cm wide.

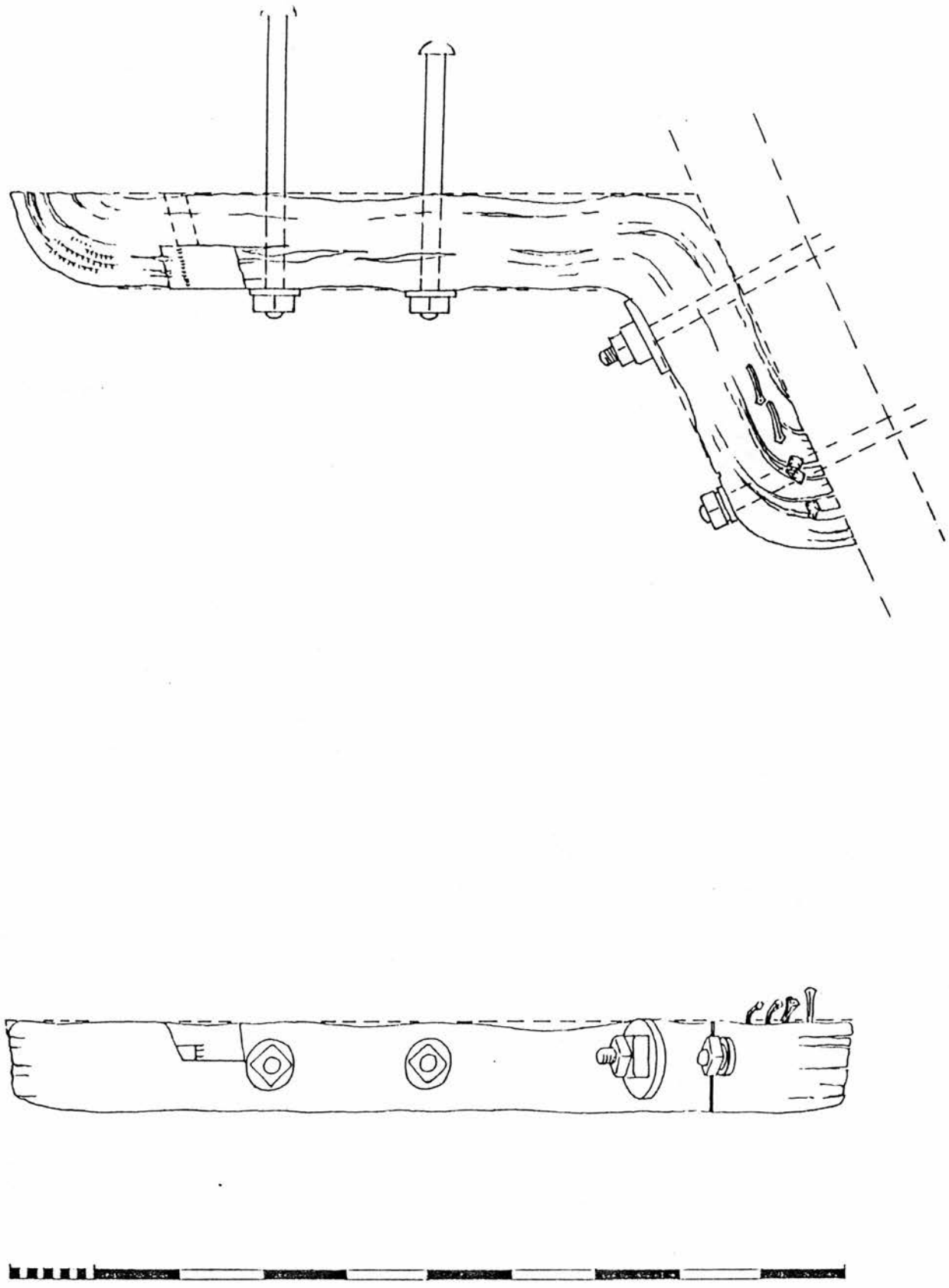
The keelson running through the centre of the hold runs from 76.5cm forward of the lodging knees for the forward transverse beam, and ends at the after transverse beam or stern end of the hold. The keelson is 25.3cm wide, 7.4cm deep, and 11.39cm long.

There are frames visible to each side of the keel at the stern, behind the aft end of the hold. These are on average 10cm by 11cm at their head, and variously act as ribs, extending to the keel but not to the other side; or as full frames shaped to the full section of the keel hull[13]. Frames are also visible toward the bow, under the broken ends of the side decks (Plates 82, 83). These frames appear to be cut back where the carvel planking begins. It is suggested that these frames have been purposely cut back at a point later than the original build, in order to accommodate the carvel planks. Below the level of the carvel planks, the frames are

ITLINGHAM KEEL — TRANSOM STERN

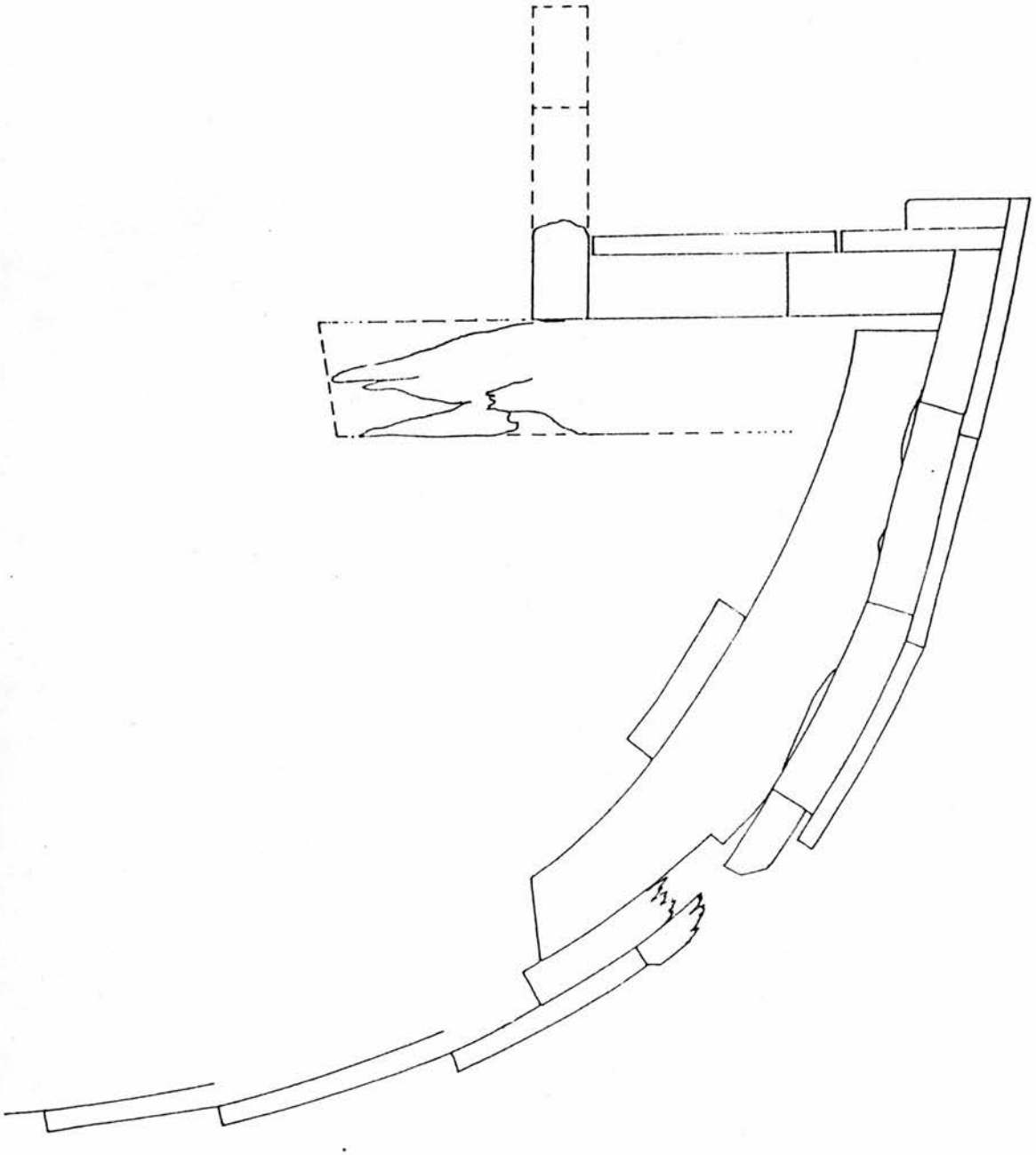


80



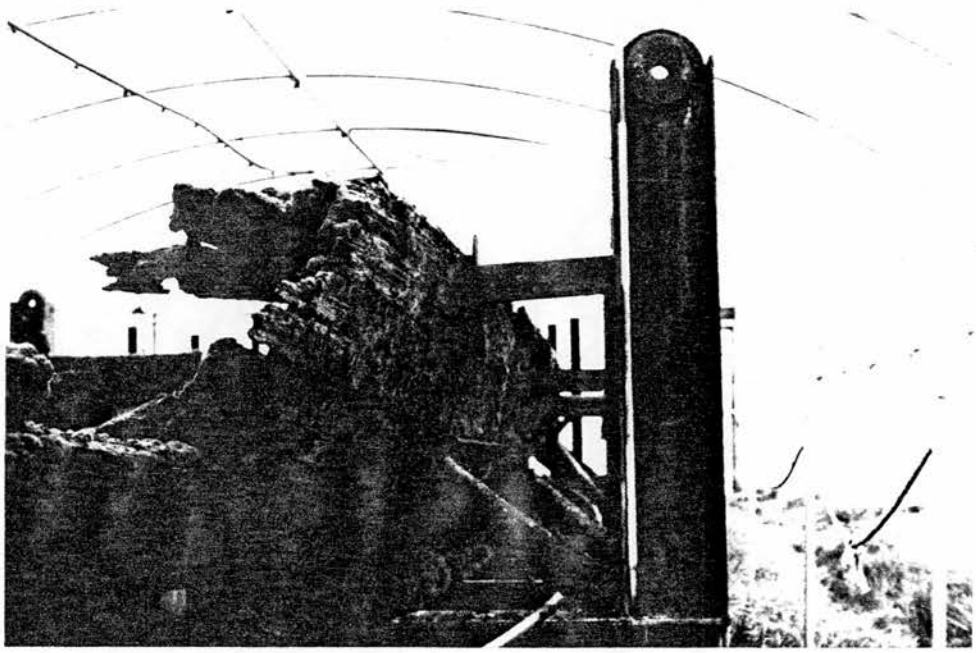
81

HITLINGHAM KEEL — STARBOARD KNEE (AT STERN)



82

HITLINGHAM KEEL — FORWARD PORT SIDE SECTION



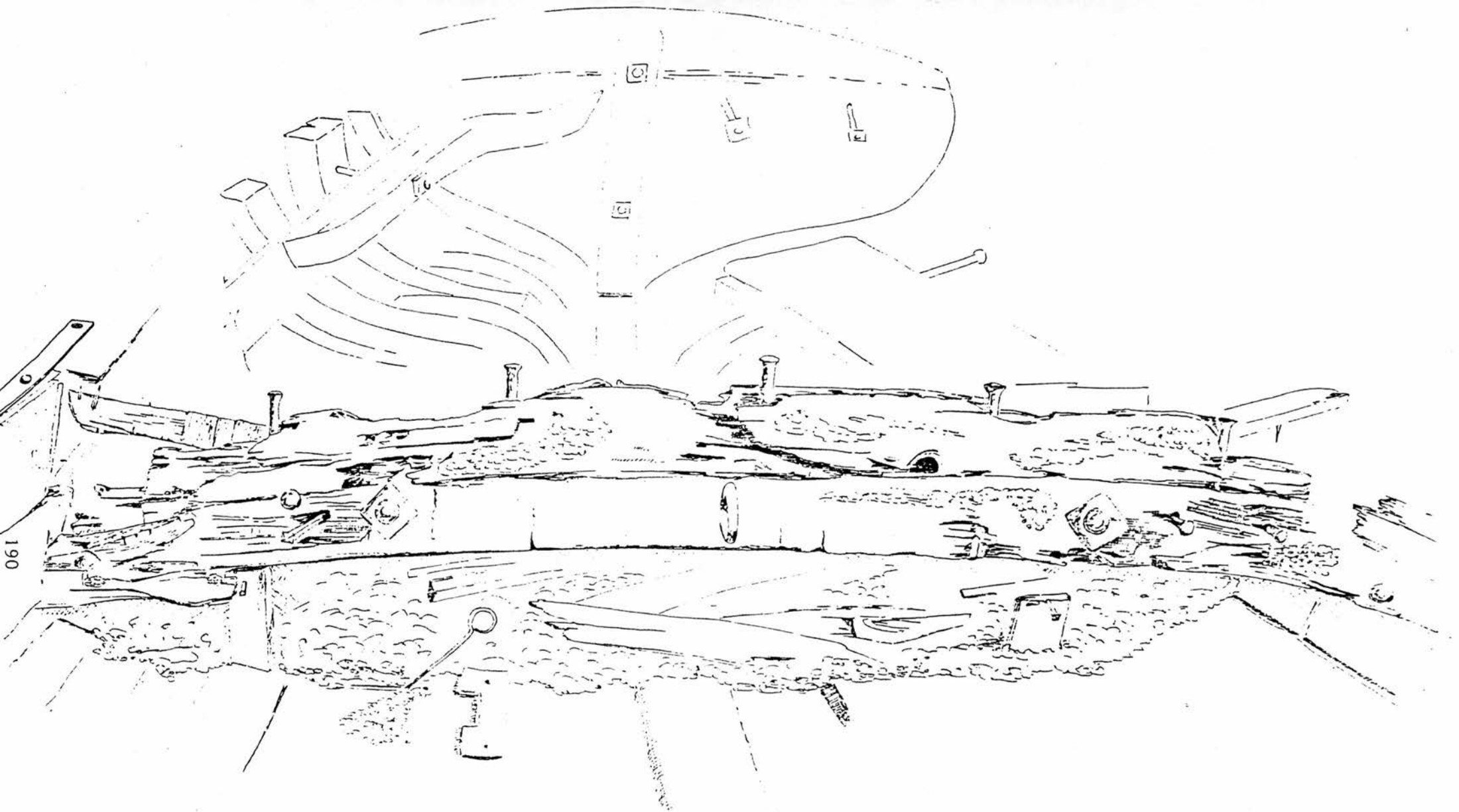
83

joggled to accommodate the clinker planks.

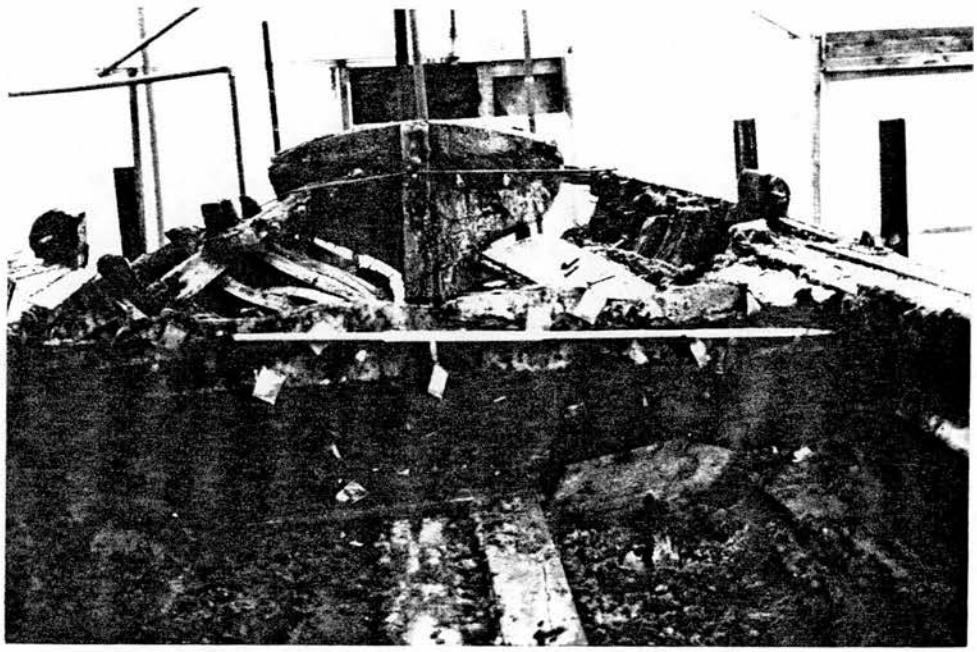
Two frame timbers are extended to form bollards approximately 2m from the stern. These extended timber heads or bollards are pierced through by iron bars, projecting approximately 20cm on each side. The timber heads are 14cm x 19cm in section above deck level, and extend 17cm above deck level.

There is one remaining of two main transverse beams (Plates 84, 85). These beams mark the forward and after ends of the hold area. The remaining transverse beam is at the after end, and is designed to be supported by large hanging and lodging knees. There are two pairs of lodging knees, attached to this transverse beam, two facing forward and two facing to the stern (Plate 86). Bolts through the forward lodging knees pierce through the transverse beam, but not through this to the matching after side lodging knees. A hanging ring (appropriate to standing rigging) is positioned in the centre of the after transverse beam or after hold wall. The horizontal or lodging knees at the forward end indicate the position of the forward transverse beam and forward end of the hold.

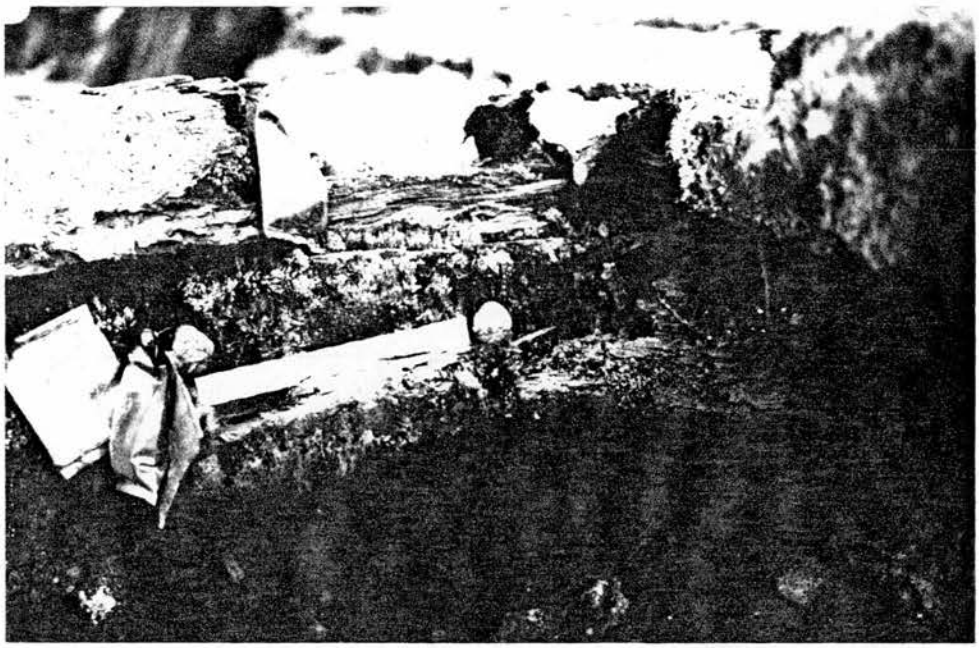
The top three strakes are carvel, the remaining strakes clinker joined. The carvel strakes are on average 24cm wide and 2.4cm thick, and form a double skin (Plate 80). The clinker strakes are on average 1.5cm thick at the lands, have less width at the turn of the bilge amidships, and average 22cm width at the stern. The strakes do not run the full length of the keel, having scarf joints at various points (future examination and dating may reveal which of these are appropriate to the original building of the keel), and narrow slightly at the stern. The fourth and fifth strakes from the



General arrangment sketch.



85

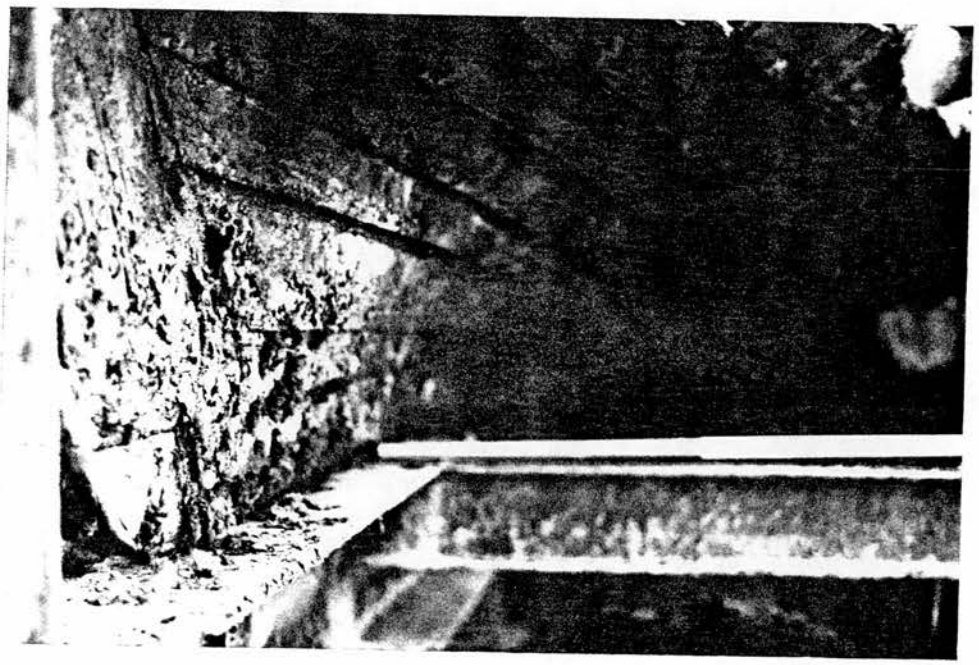


86

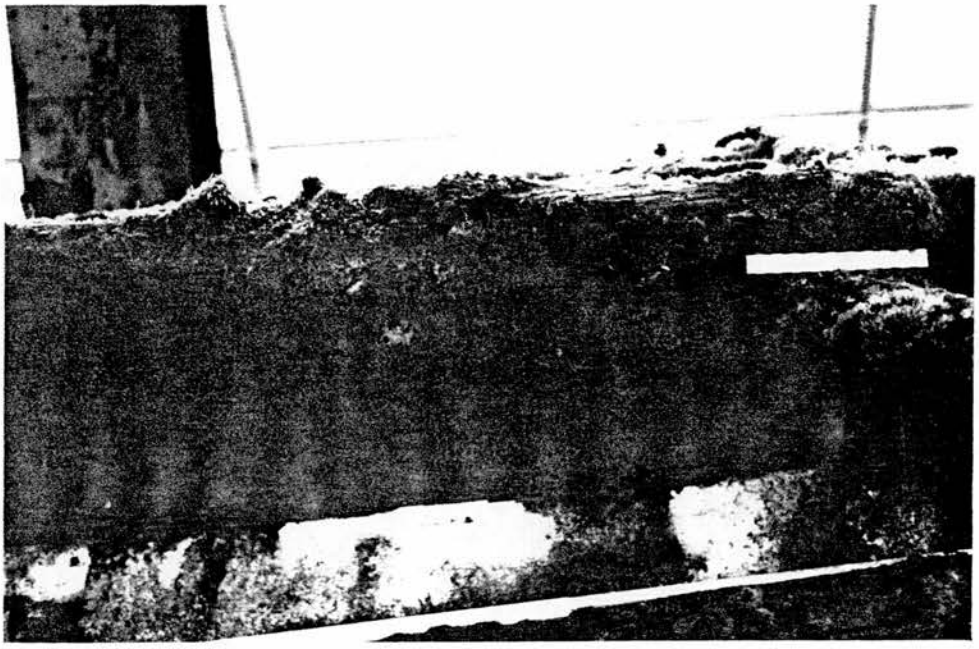
garboard strake run together as they approach the bow as stealers (strakes at a higher level finish at the broken ends of the side decks). Next to the hog (Plate 87) the garboard strakes twist (in reconstruction) from vertical at bow and stern to horizontal amidships, the underside strakes rolling in as they approach stem and stern.

A stringer 12cm by 3.9cm in section runs from bow to stern also supporting the side decks. The side decks or plankways (Plates 88, 89) are supported by uprights resting on frames near to the turn of the bilge, by some frames and by smaller lodging knees (Plates 90, 91). It is not presently possible to determine whether the gunwhale or side decks bear grooves for the top of the timber heads. The side decks are made of either single broad planks or two planks, some of these apparently split through stress during time of use. The sheer is marked by a narrow plank (apparent on the port side) covering the tops of most frames and timbers, raised approximately 3cm from the side deck.

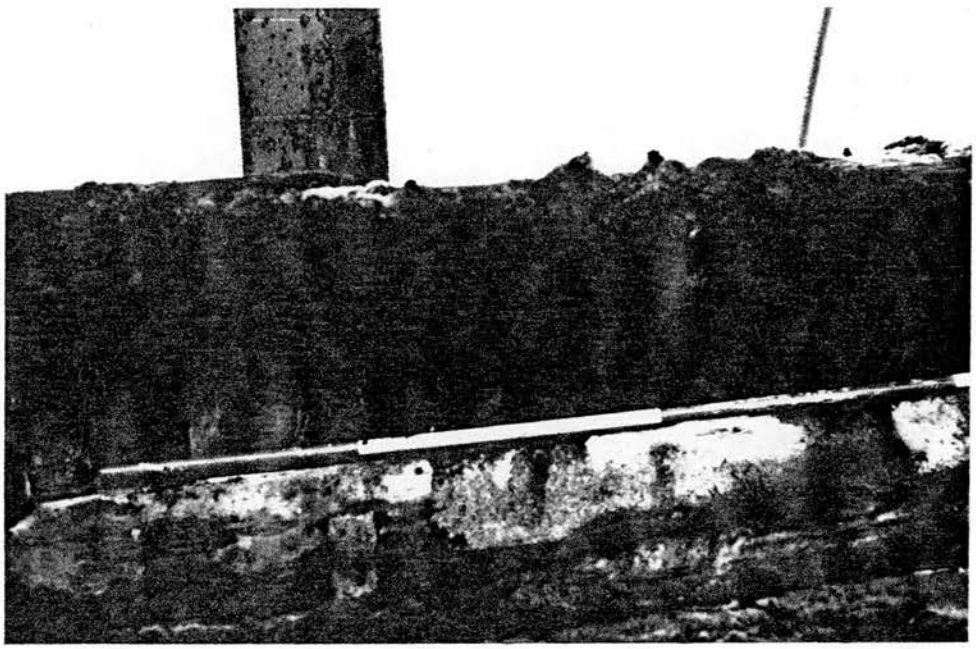
The hold is 10.6m long, and in reconstruction would make 2.70m width at the stem, 2.65m width at the stern, 3.15m wide amidships, measured between the lower part of the upright coaming. The main hold deck planking or ceiling runs to the foot of the coaming uprights. The inner wall of the hold behind the uprights consists of two rows of planking 17.7cm by 4.8cm in section. Each side of the keelson are 7 planks making up the flat hold deck, one on the turn of the bilge, and two making up the side inner wall. Flat deck planking is 18cm by 2.5cm in section. The hold deck planking rests immediately onto frames and timbers.



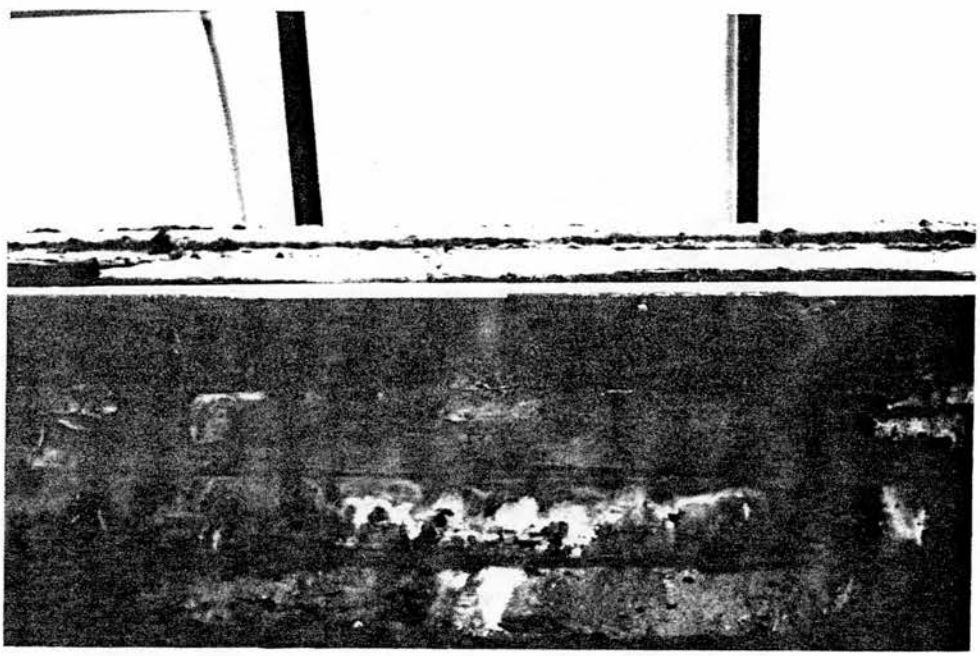
87



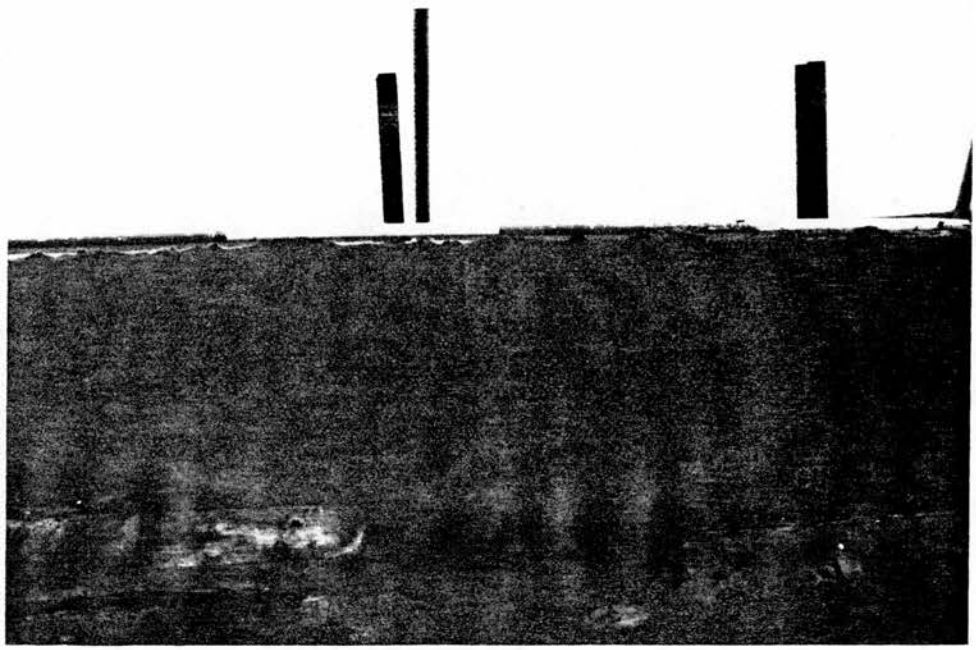
88



89



90

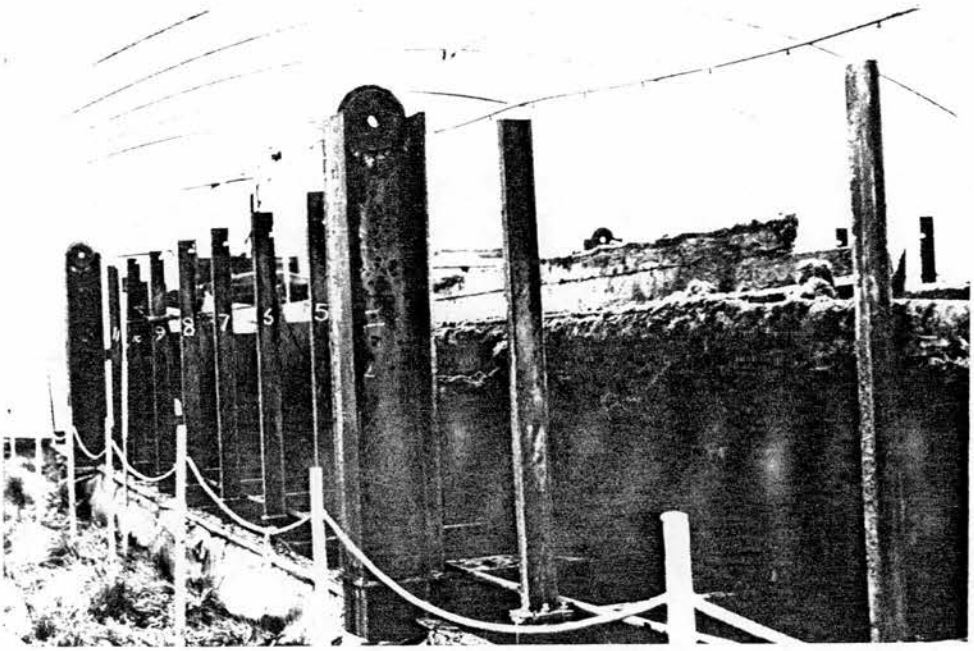


91

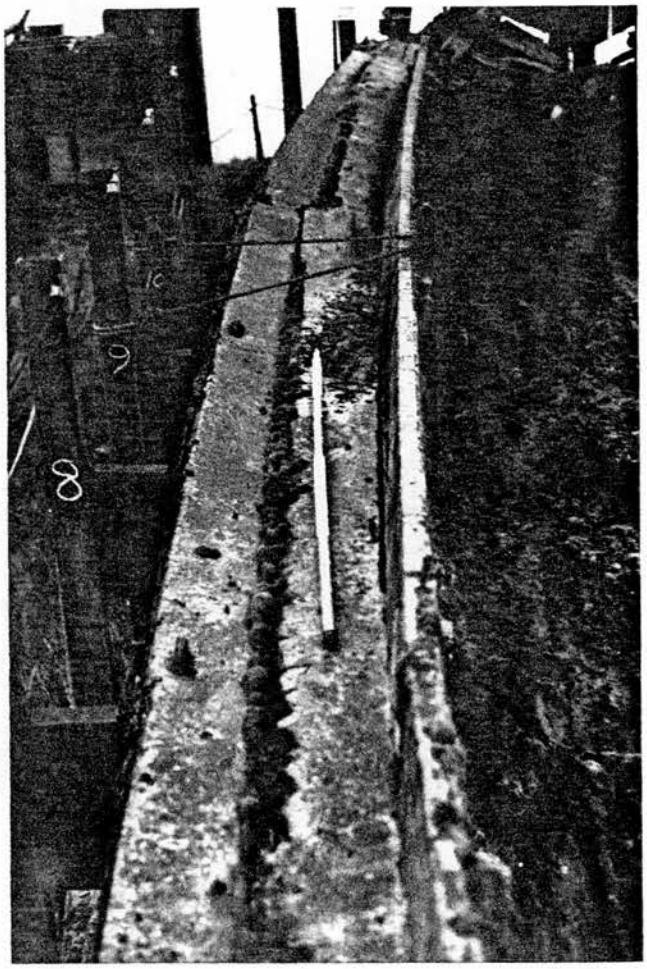
The upright coaming runs around the hold area, still apparent on both port and starboard (Plates 92, 93). The coaming appears on average to be 35cm by 5.1cm board, rising to 25cm on average above the level of the side decks. The vertical hold coamings are supported by vertical uprights. The starboard forward support is 73.5cm high, 7.5cm by 11.5cm in section. The starboard aft support is 62.3cm high, 11.3cm by 10.4cm in section: both measured to hold deck planking.

There is a rubbing or binn iron 9cm by 1.5cm in rounded section running the full length from bow to stern, on carvel planking below side deck level, designed to prevent the hull from being damaged through edge on contact with other boats or banks. Remains indicate that the rubbing iron also continued around the bow (known as a harpen iron on wherries). Below the rubbing iron, on the second carvel plank from the sheer at 0.9m and 3.06m from the stern, are two sections of wood raised from the surface of the planks. These may also have been intended to prevent damage from rubbing.

Inside the hold, the fourth deck plank in from the keelson on each side has two raised wedges. The wedges are raised 6.2cm above the normal plank surface. The wedges are 47.1cm from the keelson and 3.32m from the after transverse beam (Plate 94). Between the wedges on each side of the keelson rests a further floating or removable plank, each plank having two insets (Plate 95). Between the insets are the remains of an upright support, which had been bolted to the floating planks. There is not enough detail to show height of these upright supports, although remaining bolts and wood suggest that they may have been L-shaped, 10.4cm by 27cm by 61.3cm.

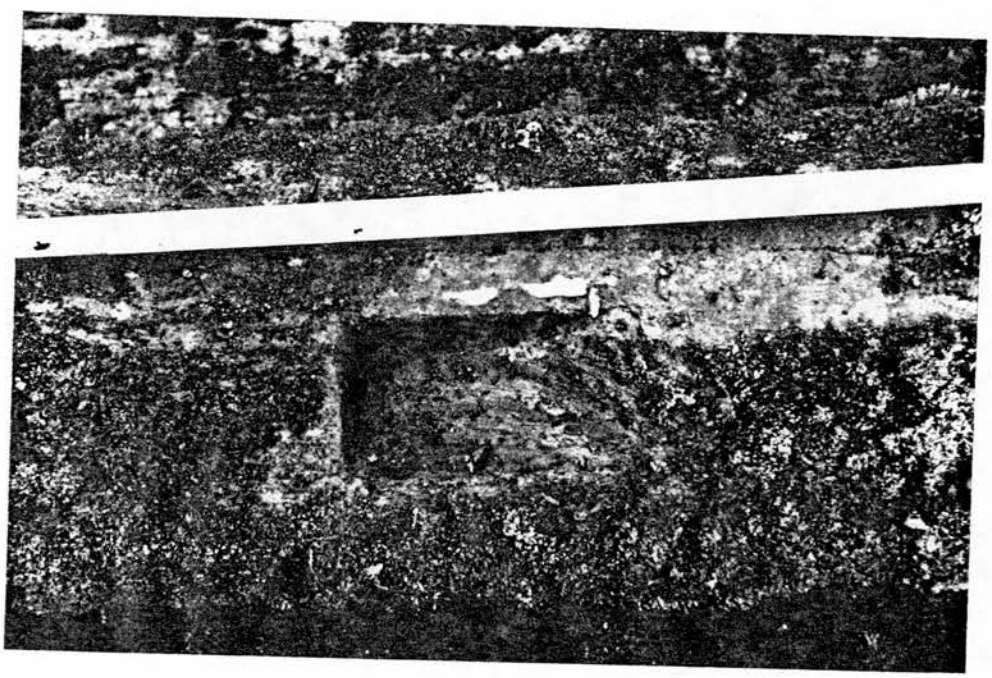


92



93

94



95

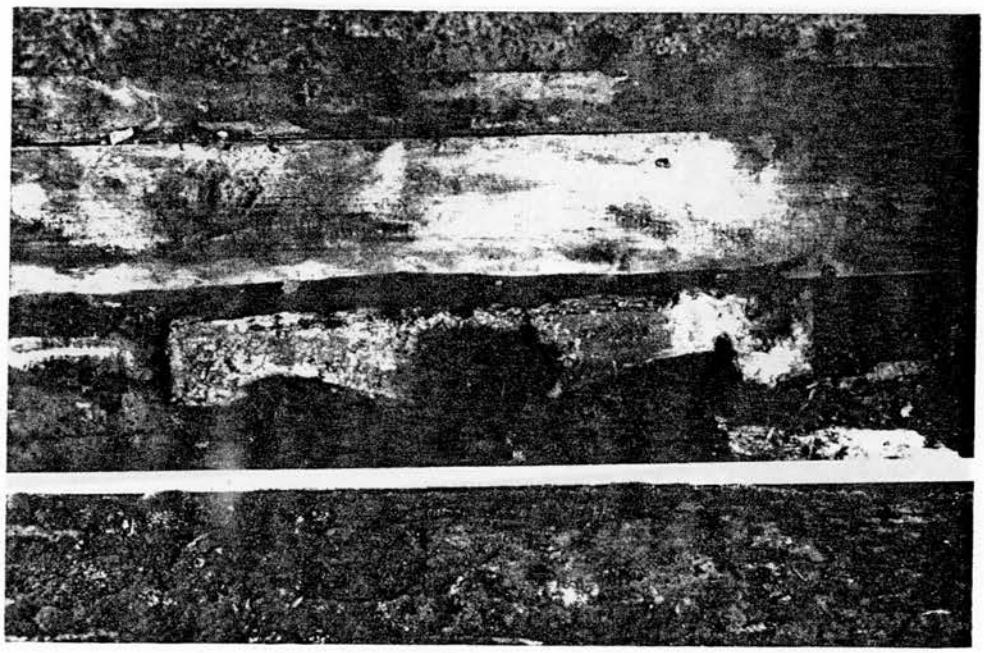
Wooden blocks with insets are placed on the walls of the hold, port and starboard, in positions complementary to the remains of the upright supports (Plates 96, 97, 98). It is suggested that a proposed reconstruction of Hobrough Depositor supports within the hold would utilise these features (Plate 99).

Planks remaining inside the bow area and set over remaining broken forward frames indicate a ceiling planking inside the bow area. These may have acted as floor to a small cabin structure (Plate 100).

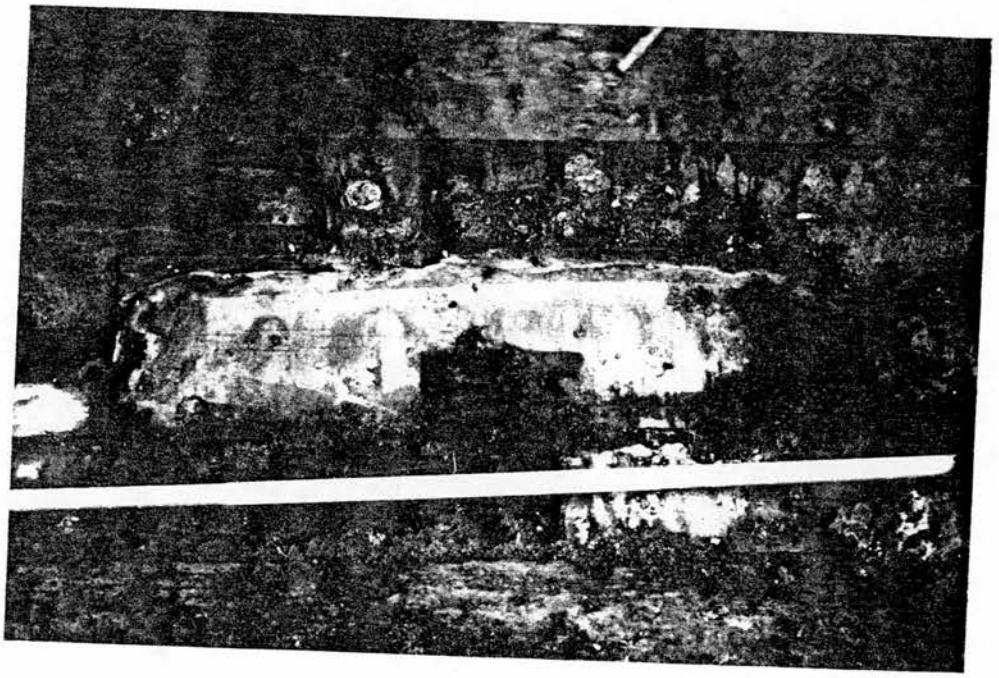
There are two rings attached to the forward port side deck, one on a flat iron base (Plates 101, 102), and the second set into the deck, bolted onto the outer edge of a frame (Plate 103). As in the Science Museum model, these rings may have been positioned for holding lines to the clew of the squaresail. A third ring set into the port side deck is positioned amidships (Plates 104, 105). A fourth ring on an iron flat base is set on the port side deck just before an extended timber head or bollard. A ring and cleating hook on a flat iron base is set on the starboard side deck just before a matching second extended timber head.

Side decks, the inner and outer side of strakes, frames, and transom, are presently covered with a tar like substance. The tar, also caulking in ceiling, and planking have not as yet been tested.

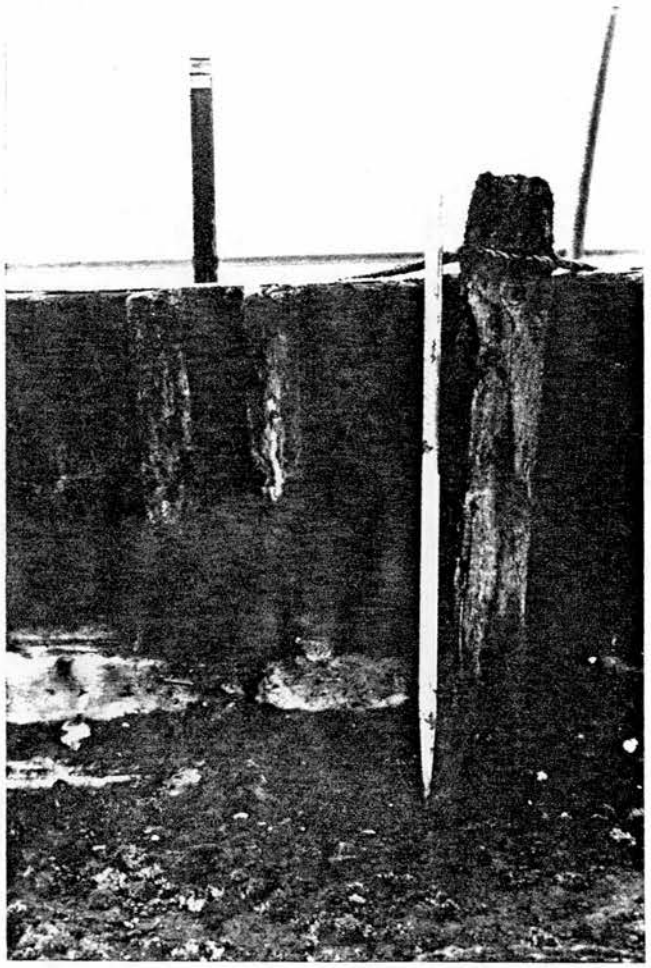
It is estimated that the Whitlingham keel may have a theoretical displacement of approximately 33 metric tons (or 35 long tons) at a draft of 1 metre. With the waterline at the gunwhale the keel would displace approximately 45 tons. Assuming that her light weight would make 15 tons, this would suggest that the Whitlingham



96

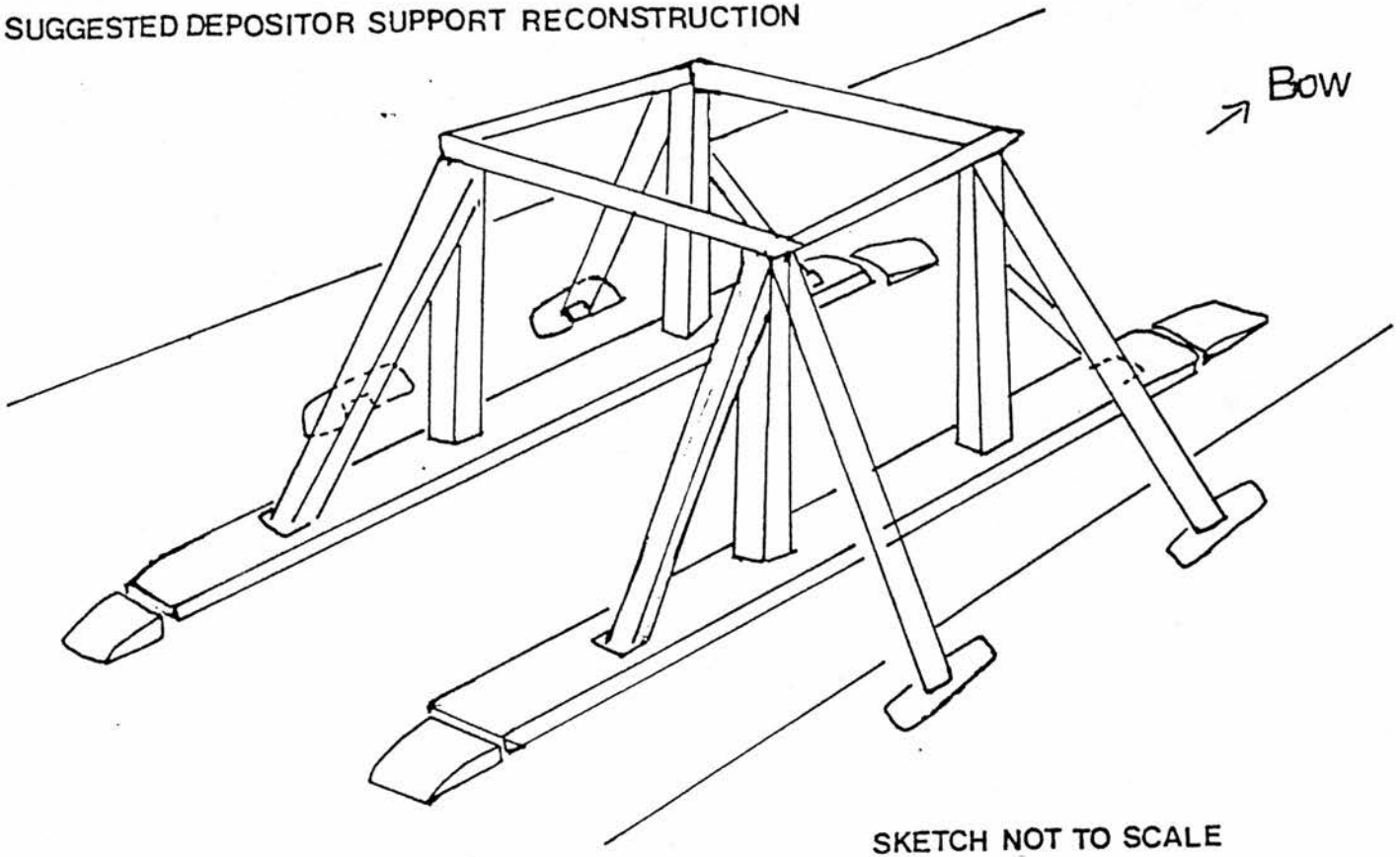


97

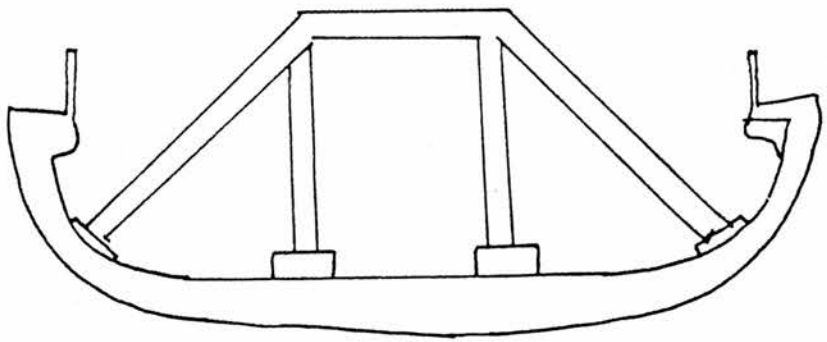


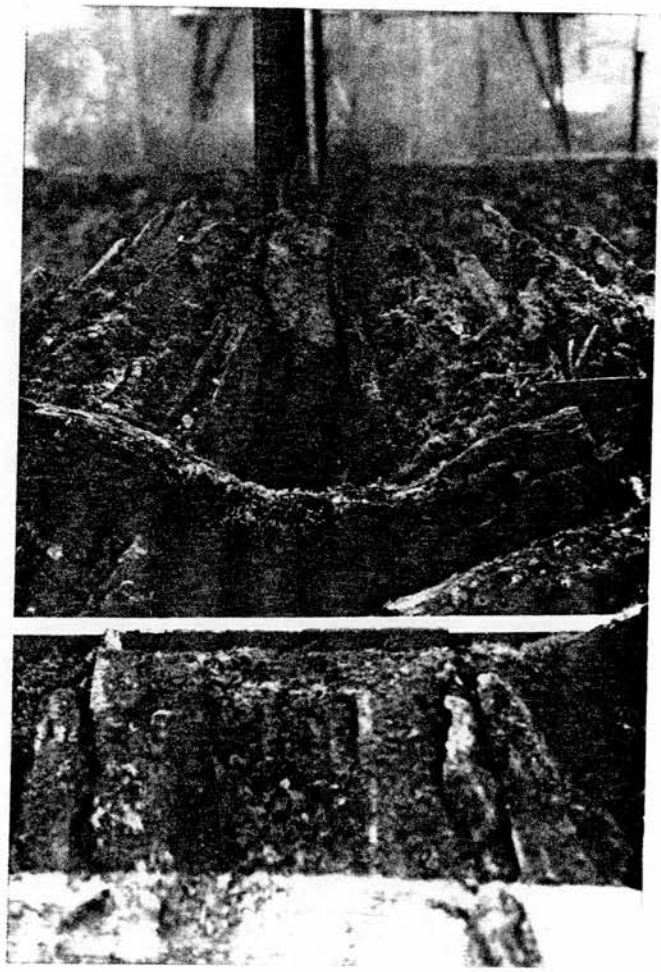
98

SUGGESTED DEPOSITOR SUPPORT RECONSTRUCTION

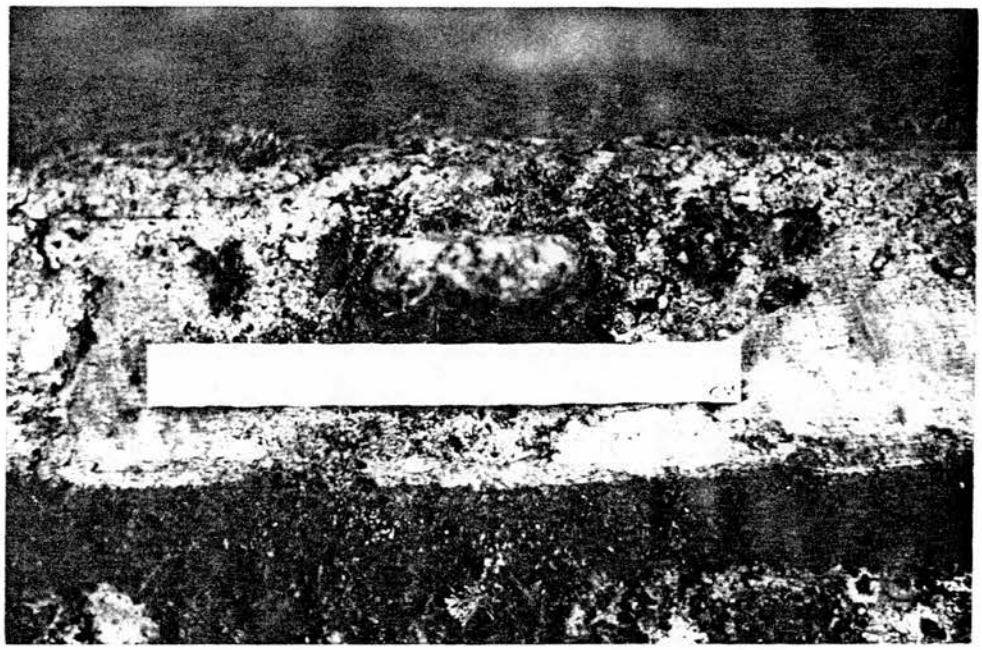


SKETCH NOT TO SCALE

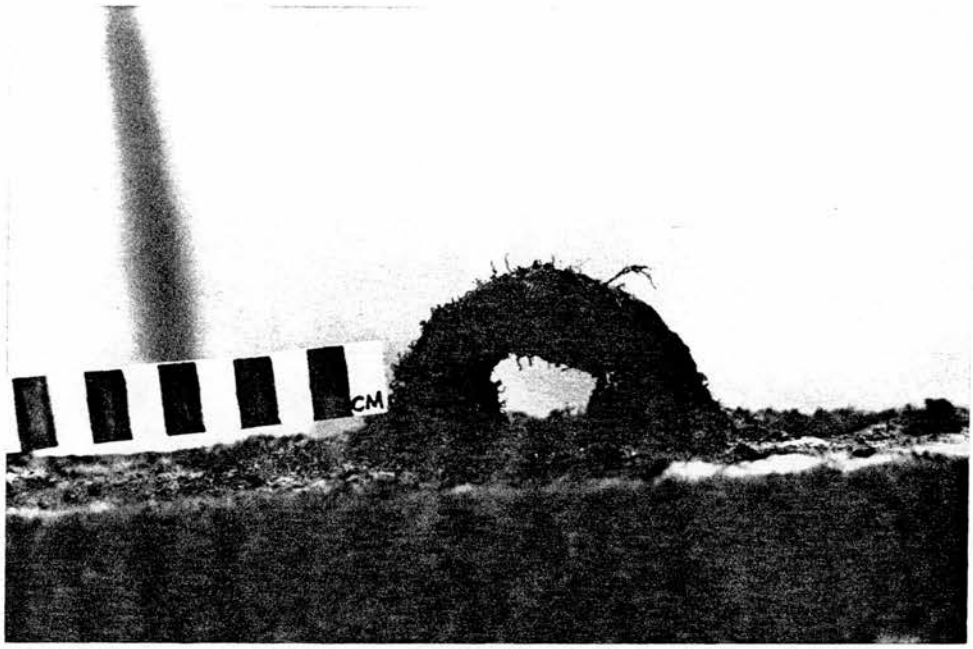




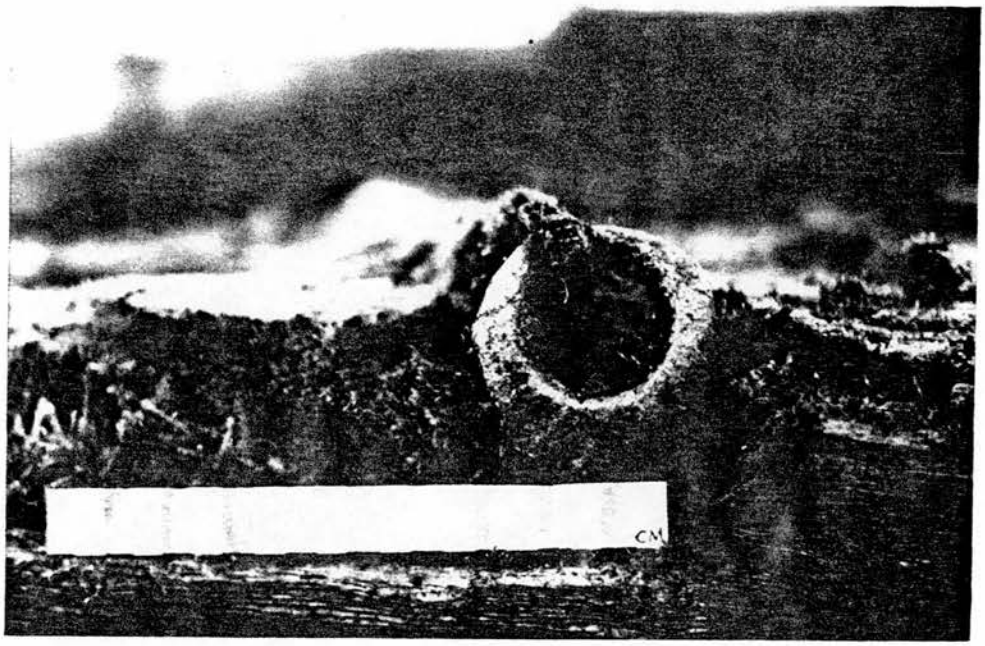
100



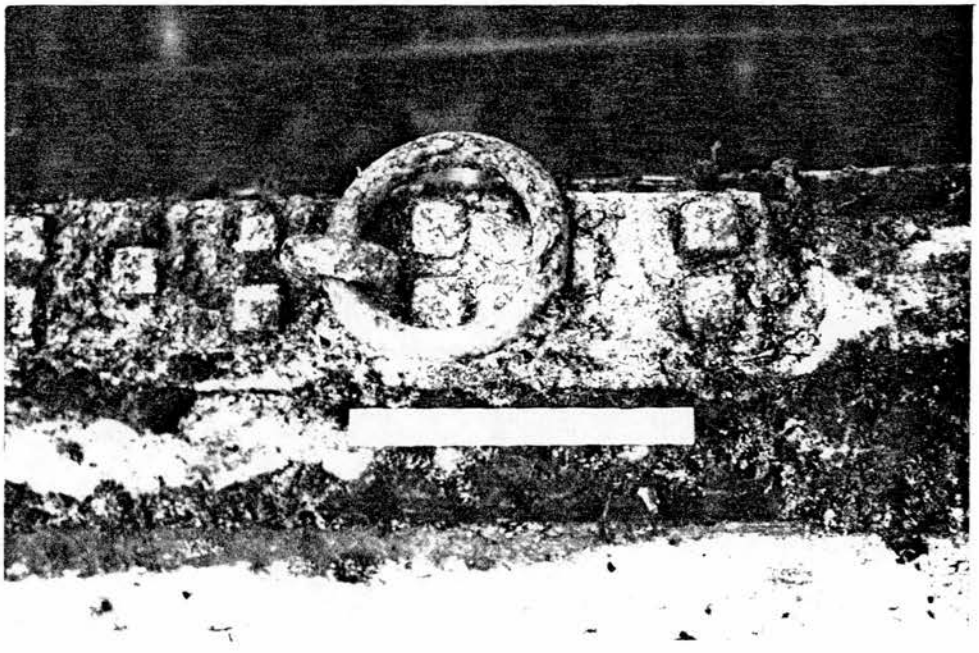
101



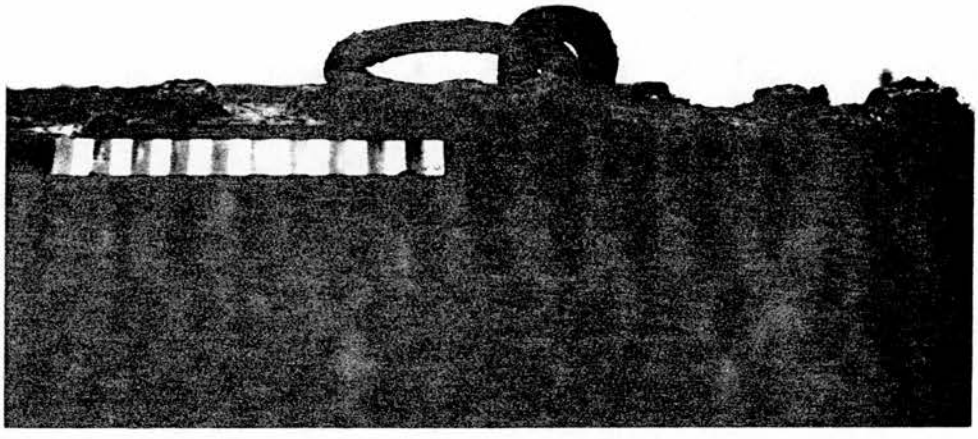
102



103



104



105

keel would make approximately 30 tons burthen.

Neither the Science nor Bridewell Museum models fully reflect the present or theoretical reconstruction shape of the Whitlingham keel. They do, however, afford a good indication of the lines and specifications of the genre of Norfolk keels toward the end of the nineteenth century, as viewed by the model maker.

The Whitlingham keel reconstructed lines give her a more shallow overall form than the models. Although the Whitlingham keel is part carvel built at her top strakes, the shape of the visible forward frames seen in section suggest that the frames were trimmed back to accommodate the carvel planks at a later refit - she was originally entirely clinker built as are the two museum models.

The damage to the bow section of the Whitlingham keel does not allow detailing of this area except in placing of some frames and strakes at the bow. The models and photographs remain the only indication of the forward shape of the Whitlingham keel.

Details available at present do not extend to the full structure and fittings of the Whitlingham keel. In the course of the conservation programme, the Norfolk Keel Trust will be removing the hold deck planks within the keel. This will reveal further details of frames, keelson, and fixings for ceiling and decks. The hull will also be lifted by hydraulics, and the underside inspected and detailed. Following treatment of the constituent parts, the hull will be reconstructed as near as possible to an original shape, following tests with further models and line shaping from the moulded and sided depths of the strakes and frames, with other structural members.

The identity of the Whitlingham keel is not firmly established, and she presently bears no name. However, an account of 1930, Through Broadland by Sail and Motor by Arthur Paterson, which is a personal account of travel and conversation, may provide a title for the last Norfolk keel:

> "On this trip, I visited that conglomerate of materials spread upon Hobrough's level at Whitlingham, being 'struck' most with two rows of huge leaden mast balancers from long 'dead' wherries ... among a growth of thistles and thorns I was shown the tabernacle of the last of the keels, 'Dilly' Smith's Dee-Dar. Smith was a flagitious old sinner, of some dubious reknown in boating circles: and his keel was his silent accomplice. The rotting hull I certainly saw, lying in a sunken line with others staked down to save the riverbank, only its gunwhales showing, but I could not swear to its identity."[14]

Epilogue

Economic pressures forced the development of Norfolk barges, and promoted standardisation in the eighteenth and nineteenth centuries. That the Norfolk keels were superseded by the Norfolk wherries does not in itself suggest that the former were father to the latter - rather, that a different genre altogether proved more efficient. The process is not sequential - the 1795 Register of Inland Shipping demonstrates that there were rather more wherries in the last quarter of the eighteenth century than has been formerly recognised, and the pictorial evidence suggests that these worked side by side with the larger keel for a considerable time. Further study of pictorial sources and dating of these may provide an indication of the advent of the gaff rig and covered hold barge in east Norfolk and thereby establish a "terminus ante quem" for the wherry, the Norfolk keels' competitor. A wider examination of contemporary diaries and surviving accounts may also suggest the more specific application of the two types on the navigation system.

A general area of further research lies in the assessment of iconographic material as an important source of information. the problems of pictorial representations, in terms of realism or imaginative reconstruction, and interpretation, need to be more fully addressed, the archaeologist or historian recognising the more specialist knowledge of art historians, who have examined the ways in which artist and onlooker record or interpret pictorial subject matter. Such factors must be recognised for the painting, etching

or photograph to be most fully understood. Pictorial sources have already been recognised and utilised by archaeologists or historians - John Morrison's reconstruction of an Athenian Trireme (1987) is a remarkable example of how such information can be employed.

Mr Hall's models of the Norfolk keel are not accurate accounts of the Whitlingham keel, but are representative of the genre of Norfolk keels, detailed at a time when living memory could illuminate what the eye could no longer see. The Science Museum model presently remains the only three-dimensional description of the standing rig of a Norfolk keel. Further models of the hull form, drawn from the Whitlingham keel, are part of the future plans of the Norfolk Keel Trust.

There is more information to be gained from the Whitlingham keel. As she is dismantled in deference to a conservation programme, she will be more fully recorded. The type of tar and of caulking used on deck and strakes may be established from surviving samples. Nails, bolts and fastenings may indicate stages in her build - samples including hand made iron work wrought in a smithy as well as pressed steel fixtures used in her repair during her long working life. Dendrochronology should establish the earliest possible date for her initial construction. Woodwork presently visible toward the stern includes frames clearly made from naturally grown crooks of oak as well as wood cut to shape - these may be a further indicator of building stages, the latter doubling the strength of older timbers.

As the conservation programme on the Whitlingham keel

progresses, the present account of her lines and specific detail may require further assessment - her reconstructed form may be more, or less, streamlined. Much debate went into the presented drawings concerning the bow area, only the lower part of which has survived. Also the beam amidships - the strakes having come away from the transom, she is slightly flattened, and therefore presently broader than would be her "natural" wont. (A suggested jostling of planks into position with hydraulic lifts would be unwise unless one had full knowledge of the strengths of all the coordinating elements involved.)

Further research on the clinker boat building tradition of Norfolk could be conducted through examination of surviving Norfolk small craft, such as the rowed and sailed "punts", reed cutters and eelmen's boats of Norfolk of the twentieth century, and earlier periods. These may serve as indicators of the variety and limitations of skills used in the many small boatyards on the navigation network.

A survey of Breydon Water may reveal the remains of further examples of Norfolk keels, wherries and perhaps local sea-going craft. The Norfolk Broads area is known also to contain sunken hulls supporting riverside housing or artificially constructed "islands". The river system has not been systematically surveyed for underwater remains of boats, although the Norfolk keel is not the only example found to date, the oldest being a logboat discovered near Acle on the Bure.

The recovered Whitlingham Norfolk keel may signal wider implications for Nautical Archaeology in East Anglia - not only in

encouraging study of inland waterway craft, but by virtue of her popularity (which enabled her recovery in financial terms) a greater interest in, and support for, the field as whole, in her home region.

Footnotes to Part I: Navigation and Trade

1. R Ruper, Ship Registry to 1707, Maritime History (4 vols, Newton Abbott, David & Charles, 1972), vol.I, pp29-45.

2. C J W Winter (Great Yarmouth town seals presently located at the Norfolk Record Office, Norwich).

3. F Blomefield, A History of Norfolk (11 vols., London, W Bulmer, 1806), vol.III, pp81-82.

4. No author given (Town seals presently located at the Norfolk Record Office, Norwich).

5. John Kirkpatrick, The John Kirkpatrick Manuscripts (Norfolk Record Office, Book of Pleas, Leet Rolls, Case 21 Shelf F Box II, Norwich, 1728):

> "for ye Tide did then come up as far as Norwich and ancient Caster, and all ye marshes now lying between those places and Yarmouth were at that tie an arm of the sea and fit for ye navigation of ye larger vessels, and ye large anchors often found in these marshes up as far as ye places I have mentioned, as well as ye testimony of ancient records, do clearly prove this thing. As long as this continued, ye mouth of ye river was an open bay which extended in bredth of ye Entrance from Gorleston to Yarmouth and Caster, and in depth up as far as Reedham having on it two seaport towns, Caster on ye North and Gavionum on its south, ye former still retains its name, but ye other was called afterwards Knobbersbury and is now Borrough castle, both of which were ancient Roman fortresses ... In ye middle of ye Bay lay a bar of sand which afterwards drying up is ye place on which a little after ye Conquest ye town of Yarmouth was built". Norfolk Record Office.

6. Untitled (Manuscript no. MS2166; Norfolk Record Office, Norwich).

7. R W Unger, The Ship in The Medieval Economy 600-1600 (London, Croom Helm, 1980), pp.204-205.

8. TS Willan, "River Navigation and Trade from the Witham to the Yare 1600-1750", Norfolk Archaeology, 26 (1938), pp296-309.

9. CJ Ridgard, "The Waveney Navigation 1670-1828", Diss Antiquarian Society Newsletter, 21 (1982).

10. Rev R Turner, A Compendium History of Yarmouth, (5 vols, Great Yarmouth, 1790), vol. I, p.171.

11. Turner, A Compendious History of Yarmouth, Vol. I, p.152

12. F Blomefield, A History of Norfolk, vol. III, p.439.

13. T Kirkpatrick, The North East Prospect of the City of Norwich (Norwich, E Kirkhall, 1723).

14. D Defoe, Tour through the Eastern Counties (Republished Ipswich, East Anglian Magazine Lt, 1949), p.87.

15. J Corbridge, Mapp of the City of Norwich (Norwich, I Harris, 1727).

16. R Malster, Wherries and Waterways, (Lavenham, Terrence Dalton, 1973), p.71.

17. Tonnage Duty receipts (Norfolk Record Office, Case 10 Shelf H Item 16, Great Yarmouth, 1726).

18. F Blomefield, A History of Norfolk, vol. III, p.442.

19. J Corbridge, Mapp of the City of Norwich.

20. P Millican, The Register of the Freemen of Norwich 1548-1713 (Norwich, Jarrolds, 1934), pp.16, 46-48.

21. S King, The City and County of Norwich (London, S King, 1766).

22. S Buck & N Buck, A South East Prospect of the City of Norwich (London, S & N Buck, 1741).

23. Accounts of Goods 1780-1810 (Yarmouth Pamphlets and Single Pieces, Y942.61 (045), Norfolk Record Office, Great Yarmouth, 1810).

24. J Corbridge, A South West Prospect of Yarmouth in the County of Norfolk (Norwich, J Corbridge, 1741).

25. P Suckling, A History of Suffolk (6 vols, London, John Weale, 1848), vol. I, p.332.

26. J Butcher, Map of Great Yarmouth (Yarmouth, Eaton & Chicheley, 1779).

27. W J Wren, Ports of the Eastern Counties (Lavenham, Terrence Dalton, 1976), p.79.

28. Rev R Turner, A Compendious History of Yarmouth, vol.4, p.53.

29. F Blomefield, A History of Norfolk, vol. III, p.439.

30. The Norfolk and Norwich Merchant's, Tradesman's, and Farmer's complete Memorandum Book, for the year of our Lord 1784 (Norwich, J Crouse, 1784)p. 21.

31. The Watermen's Society (Norwich City Records, Case 21 Shelf E Box 6, Norfolk Record Office, Norwich, 1787).

> "Charitable society, entrance fee 2s 6d and at first and second meeting, then 2s per month. Meetings first Saturday every month. After 6 months' payment, entitled to half pay and half burial money for 6 months, also sickness benefit after 12 months in society, then 10s per week for 2 months, 8s for 2 months, 6s for 4 months, and 4s 4d for 4 months, and 3s per week as long as his illness continues ... Whereas this society being called the Waterman's Society and many members thereof being Masters of Crafts and many belonging to crafts ..."

32. Register of Vessels on Inland Waterways (Norfolk Record Office, Norwich, 1790).

33. R Malster, Wherries and Waterways, pp.67-69.

34. Tonnage Duty receipts (1726).

35. R Malster, Wherries and Waterways, p.33

36. J Thirtle, Boatbuilders Yard near Cow Tower, Norwich, in M Allthorpe Guyton, John Thirtle (Norwich, Norfolk Museums Services, 1977), plate 18.

37. Norfolk Railway Surplus Lands (Accounts of the Norfolk Railway, BR61/3/22/1-16, Norfolk Record Office, Norwich, 1850).

38. S Buck and N Buck, A South East Prospect of the City of Norwich.

39. P Millican, The Register of the Freemen of Norwich, p.93.

40. R Finch, Coals from Newcastle (Lavenham, Terrence Dalton, 1973), p.24.

41. Account of Goods 1780-1810.

42. W J Wren, Ports of the Eastern Counties, p.85.

43. The Ant and Bure Canal Act (London, J Brettell, 1812).

44. R Malster, Wherries and Waterways, pp.27-30.

45. R Malster, Wherries and Waterways, p.71

46. R Malster, Wherries and Waterways, p.13.

47. D Defoe, Tour Through the Eastern Counties, p.88.

48. Act for making and maintaining a navigable communication for ships and other vessels between the City of Norwich and the Sea at or near Lowestoft in the County of Suffolk (Norwich, Brightwell, Newton & Parkinson. 1827).

49. Act for making the River Waveney navigable for Ships (Beccles, Sharpin, 1831).

50. Act for improving the Haven at Great Yarmouth (London, G Eyre & A Spottiswoode, 1835).

51. J Thirtle, "A View of Thorpe, with steam barge working up - Evening", in M Allthorpe Guyton, John Thirtle, plate 24.

52. M Allthorpe Guyton, John Thirtle, p.47.

53. Draft Contract of James Bessey & James Hayn Bessey for supply of keels and wherries for removal of mud raised by steam and horse didelling engines and for supply of horses for horse engine (Norwich City Records 27(b), Records relating to Carrow Bridge, Norfolk Record Office, Norwich, 1830).

54. James Hargrave Harrison, Account of Ballastage, supply of Land (Great Yarmouth Corporation Records, Norfolk Record Office, Norwich, 1856).

55. Norfolk Railway Surplus Lands (Accounts of the Norfolk Railway).

Footnotes to Part II: A Pictorial Account of Norfolk Keels

All figure heights are estimated as equivalent to 6ft for a standing figure, 3ft for a seated or half figure, these used as gauges for estimating equivalent vessel dimensions in some pictorial material.

1. Suggested references for the assessment of realism in pictorial representation:

   E H Gombrich, Art and Illusion, 5th edn (London, Phaidon Press, 1977), pp.55-78.

   H Read, The Meaning of Art (London, Faber & Faber, 1972), p.137.

   H Wolfllin, Principles of Art History (New York, Dover, 1950), pp.1-17.

2. J Corbridge, South West Prospect of Yarmouth in the County of Norfolk (Norwich, J Corbridge, 1741). This Prospect is 77.5cm long by 24.3cm. Inscription:

   "This town stands upon the Eastern Point of Britain, and is seated at the Mouth of the River Yare (from whence it took its Name) about two Furlongs from the Sea, on a dry Soil and in a healthful air. It was a Royal Borough in Edward the Confessor's Time, and had then in it 70 Burgesses. The Kings of England kept it in their own Hands, apply'd and took the Proffits of it to their own Use, and govern'd it by a Provost, till King John in the 9th year of his Reign, granted that the Burgesses should hold it in Fee Farm for ever, with divers other Privileges, paying a yearly rent of £55. King Henry 3rd granted them Liberty to enclose the Town with a Wall and a Ditch. King Henry 5th gave them Power to build a Bridge over the Haven, and Q, Elizabeth and King James 1st granted them an Admiralty Jurisdiction from Winterton-Ness in this County, to Easton Ness near South-wold in Suffolk, and seven Leagues to sea. The Town is a Mile in length from North to south, and is surrounded with the above said Wall and Ditch, except on the Side of the River, which forms a most commodious Haven for Shipping, having a curious Draw-Bridge over it, and for the Conveniency of lading and unlading of Ships there is a beautifull Key almost the length of the Town. 'Tis well built and populous, containing about 12000 Inhabitants, and is the chiefest Fishing Town in Great Britain, especially for Herrings. It has one Parish Church built by Bishop Herbert in the Time of William Rufus, dedicated to St Nicholas; but as this was not sufficient for the Inhabitants, a Chapel dedicated to St George, was at their own Charge, built in the Reign of King George 1st and at the same time was erected a publick Hall for the Entertainment of the Mayor and Corporation, and the Gentlemen of the Town, and Neighbourhood publick Feasts and Days of Rejoicing; both of them beautifull

Structures of Modern Architecture. It has a Court of record, which holds Pleas of all Actions as well Real and Personal as Mixt; also a Court of Admiralty, held weekly in the Tolehouse Hall and the Sessions are also kept there. There is also a Guild Hall where the Mayor is annually elected on the 19th of August, and sworn into his office on the 29th September following. It has two Hospitals, one for decay'd Fishermen and their Wives, and the other for poor Children. There are also 2 Charity Schools supported by the Subscriptions and Benefactors of the Inhabitants ... The Corporation consists of a Mayor, 18 aldermen, and 36 Common CouncilMen. The Present Members of Parliament are the Honourable Roger Townshend and Edward Walpole Esquire."

3. J Corbridge, A South West Prospect of Yarmouth in the County of Norfolk, image actual size 0.8cm by 0.5cm; estimated equivalent length of vessel: 20ft.

4. J Corbridge, A South West Prospect of Yarmouth in the County of Norfolk, image actual size 2cm by 2.5cm; estimated equivalent length of vessel: 60ft.

5. J Corbridge, A South West Prospect of Yarmouth in the County of Norfolk, image actual size 1.1cm by 1.8cm.

6. J Corbridge, A South West Prospect of Yarmouth in the County of Norfolk, image actual size 1.1cm by 1.4cm.

7. J Corbridge, A South West Prospect of Yarmouth in the County of Norfolk, image actual size 0.8cm by 1cm.

8. S Buck & N Buck, A South East Prospect of the City of Norwich (London, S & N Buck, 1741). This Prospect is 78.2cm long by 25.5cm.

9. S Buck & N Buck, A South East Prospect of the City of Norwich image actual size 1.7cm by 1.9cm.

10. S Buck & N Buck, A South East Prospect of the City of Norwich image actual size 0.7cm by 1.1cm.

11. S Buck & N Buck, A South East Prospect of the City of Norwich image actual size 1.5cm by 1.8cm.

12. Actual dimensions of present building: The arch is 2.54m at centre, 5.13m wide at present ground level, this being the maximum width for barges using the channel.

13. S Buck & N Buck, A South East Prospect of the City of Norwich, image actual size 2.8cm by 3cm.

14. S Buck & N Buck, A South East Prospect of the City of Norwich, image actual size 2.6cm by 0.4cm.

15. S Buck & N Buck, A South East Prospect of the City of Norwich, image actual size 3.5cm by 0.8cm.

16. S Buck & N Buck, A South East Prospect of the City of Norwich, image actual size 2.8cm by 3.1cm.

17. J Corbridge, The West Prospect of the Town of Great Yarmouth in Norfolk, (Norwich, F Harris, 1742). This Prospect is 124.8cm long by 37.3cm. Inscription:

"Great Yarmouth stands on ye Eastern point of Britain about two furlongs from the Sea, on a dry soil, in Lat 52 deg:43M, it is seated on ye East side of ye Yare at, a Mile & a half from ye mouth of it. It extends itself along ye said River a Mile in length from N. to S. Its surrounded nth wall & Ditch except on ye side of ye River nth makes a most Commodious Haven for Shipping and Trade. It has ye most beautiful Key and finest Wooden Bridge in England. It is well built and populous Containing about 12000 Inhabitants & ye Chiefest Fishing Town in Britain especially for Herrings in ye Months of September & October Yearly. It consists of one Parish only with one Church built by Bishop Herbert in ye time of William Rufus dedicated to St Nicholas, But as this was not sufficient for the Inhabitants, a Chappel dedicated to St George was built at their own Charge in ye beginning of ye reign of his present Maj W K Gro ch will Contain about 1500 persons At ye same time was erected a Publick hall near ye forelands End, both of 'em very handsome Structures of Modern Architecture and notwithstanding ye great sum Expended on these two Publick Buildings, to ye immortal honour of ye Corporation, there was at some time also made a most delightful Causeway of two miles over the Denes to Caister where was nothing but broken ground and not passable in the midst of Summer but nth ye greatest Danger, And this excellent road ye Corporation has obliged itself to maintain forever without payment of any Toll by Travellers passing over. The origin of this Town cannot certainly be Traced, If it was not ye Gariannonum of ye Romans, it surely rose out of its ruins. It was a Royal burgh in edward ye Confessors time, and had then in it 70 Burgesses, The Kings of England Kept it in their own hands, til ye time of King John took the profits of it to their own use & governed it by a Profectus or provost. That King incorporated it granted to ye Corporaceon all ye profits formerly paid to ye Crown nth diverse other. Privileges for a free Farm rent of £55 pr Annum is still paid. Queen Elizabeth & King James ye 1st granted it to an Admiralty jurisdiction from Winterton Ness in Norfolk to eastern Ness near Southwold in suffolk & seven leuks to Sea nth, ye Amplest Powers & Authorities exclusive of ye said High Admiral of Great Britain and ye Court of Admiralty is accordingly holden in every weekby ye Mayor of ye said Town. It has two markets Weekly vizt on Saturday and Wednesday. It sends two Burgesses to Parliament, who are now his excellency Horatio Walpole & the Honble William Townshend Esq., the Corporacon consists of a

Mayr, 18 Aldermen and 36 Comn Councilmen. This Draft was nth Georgy. In the Mayorality of Richard Ferrior Junior Esq". (1737).

18. J Corbridge, The West Prospect of the Town of Great Yarmouth in Norfolk, average actual size of images in group 2.2cm by 3.1cm.

19. J Corbridge, The West Prospect of the Town of Great Yarmouth in Norfolk, image actual size 5cm by 2cm.

20. J Corbridge, The West Prospect of the Town of Great Yarmouth in Norfolk, image actual size 3.5cm by 1.5cm.

21. J Corbridge, The West Prospect of the Town of Great Yarmouth in Norfolk, image actual size 4.3cm by 3.5cm.

22. J Butcher, A North West View of the Quay of Great Yarmouth (Great Yarmouth, J Butcher, 1790).

23. J Butcher, A North West View of the Quay of Great Yarmouth, image actual size 11.7cm by 12.5cm, estimated equivalent height of vessel: 36ft.

24. J Butcher, A North West View of the Quay of Great Yarmouth, image actual size 8.5cm by 9.1cm, estimated equivalent height of vessel: 27ft.

25. M Allthorpe Guyton, John Thirtle (Norwich, Norfolk Museums Services, 1977).

Note: Although most of Thirtle's paintings concern themselves with Norfolk, his eye for the settings and contents of waterways was not confined to East Anglia. "Putney Bridge, London", shows a Thames waterside presented in very typical Thirtle style, tree lined banks revealing the occasional misty glimpse of a building. It also demonstrates a clear interest in the variety of boat forms to be seen on other inland waterways. Perhaps the subject of this also reminded him of the Norfolk keels, and his home: it is a square rig barge, mast stepped well forward. Four lines run from mast top to a walkway gunwhale, further lines running from the ends of the spar to the stern, and from clew and tack of the square sail to points on the sides amidships. She is double ended, before the stern two figures sit by her rudder. She has an open hold filled high with cargo. Her rig and form do not appear suited to coastal passage. She is a square sailed Thames barge or lighter, or an earlier Thames equivalent to the keel type.

26. J Thirtle, "The Devil's Tower and Carrow Bridge" in M Allthorpe Guyton, John Thirtle, plate 50.

27. J Thirtle, "Thorpe Watering", in M Allthorpe Guyton, John Thirtle, plate 42.

28. J Thirtle, "Thorpe Staithe", (1829) in M Allthorpe Guyton, John Thirtle, plate 53.

29. J Thirtle, "View of the River near Cow's Tower", Norwich, (1810), in M Allthorpe Guyton, John Thirtle, plate 1.

30. J Thirtle, "Rainbow Effect, on the River, King Street, Norwich", (1817), in M Allthorpe Guyton, John Thirtle, plate 41.

31. J Thirtle, "Boat Builder's Yard, near the Cow's Tower, Norwich", (1810), in M Allthorpe Guyton, John Thirtle, plate 18.

32. The top of a large, wide tabernacle, typical of wherries, shows at the forward part of an open hold. The clinker strakes sweep up nicely to the bow. The stern also appears to come to a point from rounded sides - making this a beamy double ended craft. A man sits on a stool, checking the lands on the starboard side. His fellow works an adze on a plank on the ground under the bow on the port side.

33. J Stannard, "Boats on Breydon" (1825), in A W Moore, The Norwich School of Artists, (Norwich, Norfolk Museums Services, 1985), p.102.

34. W M Blake, "The Norfolk Wherry", Yachting Montly, Vol. LIV, no. 321 (1933), pp.193-195.

35. I Preston, Fort and Mouth of the Yare, (Norwich Local History Library Collection, 1819).

36. Draft contract of James Bessey and James Hayn Bessey for supply of keels and wherries for removal of mud raised by steam and horse didelling engines and for supply of horses for horse enginge, Norwich City Records 27(b), Records relating to Carrow Bridge, Norfolk Record Office, Norwich, 1830.

37. J W Robberds, Scenery of the Rivers of Norfolk, comprising The Yare, The Waveney, and the Bure from pictures painted by James Stark, with historical and geological descriptions, (Norwich, John Stacey, 1834).

38. J Stark, "View of the Yare near Thrope Church" (1928) in J W Robberds, Scenery of the Rivers of Norfolk", plate 10.

39. J Stark, "Harrison's Wharf King Street, Norwich", (1849) in J W Robberds, Scenery of the Rivers of Norfolk, plate 28.

40. J Stark, "Carrow Bridge", (1833) in J W Robberds, Scenery of the Rivers of Norfolk, plate 16.

41. J Stark, "Carrow Abbey", in J W Roberts, Scenery of the Rivers of Norfolk, plate 29.

42. Privately owned by Mr G Sambroke Sturgess.

43. J Stark, "Mutford Bridge", in J W Robberds, Scenery of the Rivers of Norfolk, plate 14.

44. J Stark, "Shipmeadow Lock", in J W Robberds, Scenery of the Rivers of Norfolk, plate 22.

45. J Stark, "Mouth of the Yare", in J W Robberds, Scenery of the Rivers of Norfolk, plate 2.

46. J Thirtle, "A View of Thorpe, with Stem Barge working up - Evening", (1815), in M Allthorpe Guyton, John Thirtle, plate 24.

47. R Malster, Wherries and Waterways, (Lavenham, Terrence Dalton, 1973), pp.84-86.

48. J Stark, Yarmouth Regatta, (1831), in J W Robberds, Scenery of the Rivers of Norfolk, plate 9.

49. D Burwash, English Merchant Shipping 1460-1540, (Newton Abbott, David & Charles, 1969), p.141.

50. The Norfolk and Norwich's Merchant's Tradesman's and Farmer's complete Memorandum Book, for the Year of our Lord 1819 (Norwich, Burkes & Kinnebrook, 1819), p.31.

51. Other two masted small boats of the British Isles include the Hastings Lugger, the Scottish Scaffie (lug rig, popular before the Zulu), the Yawl (Yacht rig), Flushing Pilot Lugger, Fifie (very like a Cornish lugger) - all seagoing.

Of inland barges there are also the Barge Yacht (usually Yawl rigged, spritsail with gaff), some Spritsail rigged Thames Barges (the second mast to the stern, ketch styled, acting as a steersail) or Ketch rigged barges. An example of this last is the Garson, built in Yarmouth in 1864, and originally cutter rigged. All these types were capable of navigating the wider inland waterways as well as seagoing coastal activities. Many also carried leeboards to further accommodate tacking in their shallow drafted broad hulled craft.

52. R Finch, Coals from Newcastle, (Lavenham, Terrence Dalton, 1973), inside cover.

53. R Finch, Coals from Newcastle, pp.29-30.

54. R Clarke, Black Sailed Traders, The Keels and Wherries of Norfolk and Suffolk (Newton Abbott, David & Charles, 1972), p.41.

Footnotes to Part III: The Last of the Norfolk Keels

&

Part IV: The Whitlingham Keel

1. H H Brindley, "Norfolk Keels", in Mariners Mirror, XIII (1927), pp.99-100.

2. R Malster, unpublished hand notes.

3. Hobrough Depositor advertisement (Norfolk Local Studies Library).

4. C Fisher, unpublished record.

5. J S Hobrough, photographs (photographs by J S Hobrough are now held at the Bridewell Museum, Norwich).

6. The Water Transport Department of the Science Museum at Kensington, London, report that no documents relating to the 1912 excavation have survived, although it is possible that a member of the museum staff did take part in the excavation of 1912.

7. The running rigging of the Bridewell Museum Norfolk keel model is not presently rigged in a workable fashion.

8. E W White, British Fishing Boats and Coastal Craft: Historical Survey and Catalogue of the Collection (London, Science Museum reprint series, 1973), p.64.

   Further information provided in reference to the Science Museum model:

   "In hull, the keels and wherries of Norfolk differ only in the form of the stern. Although from the analogy of other vessels it might be expected that the simpler pointed stern of the wherry represented the older type, derived directly from the marshman's punt, the fact is that illustrations of transom-sterned keels are known some sixty years before the first representation of a double ended wherry. It is probable, therefore, that the two types existed side by side throughout the eighteenth and nineteenth centuries.

   "In rig the single square sail of the keel dates back long before the gaff sail of the wherry. Despite the similarity in name, it is this primitive square sail alone that any resemblance exists between the keels of Norfolk and of Yorkshire, for while the former are clincher built with sloping floors and a transom stern, the latter are carvel built with almost flat floors, a very full bilge and a stern which is rounded just like the bow."

9. C Fisher, unpublished record.

10. Team members, Norfolk Archaeological Diving Unit: Theole Douglas-Sherwood (Leader), Clive Wainwright, Thomas Conlin, Richard Allen, Jack Curl, Malcolm Framlingham.

11. T Douglas-Sherwood, Report to the Norfolk Keel Recovery Action Group (Norwich, Norfolk Archaeological Diving Unit, 1984).

12. Also seen, with iron bar, on the bow of the ice wherry derelict at Lake Lothing, Lowestoft, plates 75 and 76.

13. Tool marks on these frames may afford further information on building techniques in future study.

14. A Patterson, Through Broadland by Sail and Motor (London, Blakes Ltd, 1930), p.129.

Appendix I

Register of Vessels on Inland Waterways (1795), transcript of Act:

Town and Borough of Great Yarmouth in Norfolk. 7th July 1795.

Whereas by an Act made and passed in the last session of Parliament, intitled - "An Act for requiring all Boats, Barges, and other Vessels, of certain Descriptions, used on navigable Rivers, and on inland Navigations, in Great Britain, to be registered, it is enacted, that every Lighter, Barge, Boat, Wherry, or other Vessel, exceeding the Burthen of thirteen Tons, which from and after the 15th June, 1795, shall be worked, rowed, or navigated in or upon any River, Canal, or other inland Water or Navigation, in Great Britain, shall be registered in Manner therein mentioned, and that the Person or Persons claiming the Property therein, shall on or before the said 15th Day of June, 1795, cause the same to be registered, and shall obtain a Certificate from the Clerk of the Peace, or Town Clerk of the County, riding, Division of Place to which such Lighter, Barge, Boat, Wherry, or other Vessel shall belong, in Manner therein directed, or from their respective Deputies; and that every such register and Certificate respectively shall truly set forth whether the Vessel so to be registered, be a Lighter, Barge, Boat, Wherry, or what other Vessel, and also the Name or Names, with the Place or Places of Abode of the Master of Person having the Charge or Command thereof, together with the Number and Capacities of all and every Person or Persons respectively then and usually employed in working the same, and also the Burthen thereof, and also to the best of his or their Belief, shall give a just account of the Line and Extent of the Navigation in which such vessel hath been usually navigated, and where situated. And it is also in and by the said Act further enacted, that if any Lighter, Barge, Boat, or other Vessel, exceeding the Burthen of thirteen Tons as aforesaid, shall be worked, rowed, or navigated in or upon the River, canal, or other inland Water or Navigation, at any Time after the said 15th of June, 1795, without being duly registered, and Certificate thereof duly obtained according to the Direction of this Act - every such Lighter, Barge, Boat, Wherry, or other Vessel, shall be forfeited and lost, and shall and may be seized by any Surveying Officer or Officers appointed under the Authority of this Act, and the Master or other Person having or taking the Charge or Command thereof, shall for every Day on wich such Lighter, Barge, Boat, Wherry or other Vessel, shall be worked, rowed, or navigated as aforesaid, contrary to this Act, forfeit the sum of TEN POUNDS. - This Act to continue until the 5th Day of April, 1798.

This public Notice is given,

That all owners of Lighters, Barges, Boats, Wherries, or other Vessels, which are or shall be worked, rowed, or navigated, in or upon any river, or inland Water or Navigation, within this Borough,

or within the Liberties thereof, may register the same with the TOWN CLERK of this Borough, and obtain Certificates of such Registry, in Pursuance of the said Act, on Application for that Purpose of the Town Clerk's Office.

Appendix II

Register of Vessels on Inland Waterways (1795): Transcript of entries

K = Keel W = Wherry

Reg.No.		Date of registry	Master	Name	Tonnage	Waterman or boy	Route	Miles
1.	K	10.7.95	John Harvey	Edmund	90	Joseph Jay Wllm. Riddleswell Robert Tooley	GY-Nor of GY	30
2.	K	10.7.95	Wllm. Empson	Supply	95	John Pile	GY-Nor of GY	30
3.	W	10.7.95	Joshua Jay	Success	40	M Marshall	GY-Nor of Nor	30
4.	W	10.7.95	Robert Notts	Robert & Mary	45	Wllm Nobbs	GY-Nor of Nor	30
5.	W	15.7.95	Chris Royall	Douglas	40	C Royall Jnr	GY-Nor of Nor	30
6.	W	15.7.95	Willm Sefeven	Endeavour	37	Sam Stevens	GY-Nor of Nor	30
7.	W	15.7.95	James Morris	Alert	33	Bevis Teasdale	GY-Nor of Nor	30
8.	W	15.7.95	Ed Phillips	Atalanta	33	Thomas Lane	GY-Nor of Nor	30
9.	W	15.7.95	Ed Fuller	Mayflower	50	J Sykes	GY-Nor of Nor	30
10.	W	15.7.95	John Leeds	Friendship	35	W Lamb	GY-Nor of Nor	30

11.	W	15.7.95	James Briggs	Mayflower	20	Isaac Green	GY-Nor of Nor	30
12.	K	15.7.95	Henry Wells	William	70	Tom Shittleburgh	GY-Nor of GY	
13.	K	16.7.95	John Ward	William & Mary	40		GY-Nor of GY	30
14.	K	16.7.95	John Crancker	William	60	Rob Godfrey	Nor-GY of Nor	30
15.	W	16.7.95	Gilbert Crane	Mayflower	40		GY-Nor of GY	30
16.	K	16.7.95	James Hutsan	Marlborough	80	John Thomas John Hall	GY-Nor of GY	30
17.	K	16.7.95	Willm Tompson	Constitution	70	Tho Pile Jnr Wllm Tompsan Jnr	Nor-GY of Nor	30
18.	K	16.7.95	Robert Osborn Jnr	Resolution	60	Mattw Fairchild	Nor-GY of Nor	30
19.	K	16.7.95	John Roper	Augustus	70	John Callow	Nor-GY	30
20.	K	17.7.95	Thomas Pile	Industry	70	Wllm Pile	Nor-GY of Nor	30
21.	K	17.7.95	James Gates	Conclusion	70	Wllm Alden	Nor-GY of GY	30
22.	K	17.7.95	Wllm Paston	Union	70	Rob Angers	Nor-GY of Nor	30
23.	K	17.7.95	Godfrey Seamen	Friendship	60	George Lindsay	GY-Nor of GY	30

24.	K	17.7.95	John Starkey	Royal Oak	70	Joseph Jay	GY-Nor of GY	30
25.	W	17.7.95	John Burgess	Olive Branch	20	Wllm Lullman	Nor-GY of Nor	30
26.	K	17.7.95	Robert Kett	Elizabeth	60	John Moon	Nor-GY of Carrow	30
27.	W	17.7.95	Edward Smith	Wllm & Betsy	43	John Luith	Coltishall-GY of Coltishall	
28.	W	18.7.95	Thomas Crane	Friends Lucreave	30		Repps-GY of Repps	
29.	B	18.7.95	James Myhill	Mayflower	14		Martham-GY of Martham	
30.	K	18.7.95	Wllm Lewis	Beehive	80	J Wakefield	GY-Nor of GY	
31.	W	18.7.95	Edward Reynolds	Crostwick	21		Horstead-GY of Horstead	
32.	W	18.7.95	J Reynolds	Union	28		Horstead-GY of Horstead	
33.	K	18.7.95	Wllm Eldridge	Susanna	30	J Eldridge	GY-Nor of GY	
34.	W	18.7.95	J Dawson	Friends Increase	28	Rob Watson	Sommerton-GY of Sommerton	24
35.	W	18.7.95	Rob Hewstead	Friendship	24		Potter Heigham-GY of Potter Heigham	20
36.	W	18.7.95	J Bowering	Friends Increase	24		Potter Heigham-GY of Potter Heigham	

37.	W	18.7.95	J Moose	Land Provider	24		Hickling-GY of Hickling	
38.	W	18.7.95	Valentine Reeve	John & Sarah	24		GY-Nor of GY	
39.	K	18.7.95	John Reeve	Duck	30		GY-Nor of GY	
40.	B	18.7.95	John Gunnel	Active	16		Barton Turf-GY of Dilham	20
41.	W	18.7.95	Benjamin Mayes	Hopewell	16		Sutton-GY of Sutton	30
42.	W	18.7.95	R Barker	Willock	16		Sutton-GY of Sutton	30
43.	B	18.7.95	Wllm Neave	Britannia	16		Stalham-GY of Stalham	
44.	W	18.7.95	Ishmael Waterton	Edward	16	Ed Waterton	S Walsham-GY of S Walsham	
45.	W	18.7.95	Ed Shingles	Fair Trader	16	John Wright	Acle-GY of Acle	
46.	W	20.7.95	Wllm Horn	Friends Adventure	35	Wllm Horn Jnr	Coltishall-GY of Coltishall	
47.	W	20.7.95	Wllm Marlin	Friendship	30		Coltishall-GY of Bellaugh	
48.	K	20.7.95	Rich Thorning	William & Mary	75	John Blakemore	Nor-GY of Nor	
49.	W	20.7.95	John Thomas	Robert Frances	43		GY-Nor of GY	

50.	W	20.7.95	Sam Pawson	Barleycorn	20		Coltishall-GY of Coltishall	
51.	W	20.7.95	John Fox	Harvest House	20		Coltishall-GY of Coltishall	
52.	W	21.7.95	James Hunt	Industry	34		GY-Nor of Norton	
53.	W	21.7.95	Wllm Callow	Mutford	20		GY-Nor of GY	
54.	W	21.7.95	Barnard Stephens	Active	28		GY-Nor of GY	
55.	W	21.7.95	David Monen	Liberty	40		GY-Nor of GY	
56.	W	21.7.95	J Mungay	Royal George	20		Flixton-GY of Flixton	
57.	W	22.7.95	J Benton	Adventure	20		Wroxham-GY of Overton	
58.	W	22.7.95	Stephen Darby	Perseverance	24		Bungay-GY of Wainford	
59.	W	22.7.95	R Darby	Lutsepid	20		Bungay-GY of Wainford	
60.	W	22.7.95	W Barber	Good Intention	20	J Worledge (boy)	Lowestoft-GY of Lowestoft	23
61.	W	23.7.95	John Kirt	Providence	40		Horning-GY of Horning	20
62.	W	23.7.95	Thom Hunt	Endeavour	22		Hardley-GY of Geldestone	
63.	K	23.7.95	J Wakefield	Flora	70		GY-Nor of GY	

64.	W	23.7.95	D Shingles	Providence	20		Acle-GY of Acle	12
65.	W	23.7.95	C Rumble	Mayflower	20		Ranworth-GY of Ranworth	
66.	W	23.7.95	M Jay	Rover	20	R Crawforth (boy)	Nor-GY	
67.	W	23.7.95	Gould Scott	Wheatsheaf	42		Coltishall-GY of Coltishall	
68.	W	23.7.95	John England	Active	20		Cantley-GY of Nor	
69.	W	24.7.95	J Taylor	Mary	42	J Dunham (boy)	Nor-GY of Nor	
70.	W	25.7.95	J Harrison	Britannia	20		Hokesby-GY of Hokesby	
71.	W	25.7.95	W Bowley	Maud	14		Tunstall-GY of Tunstall	
72.	K	25.7.95	Wllm Thomas	Recovery	85	N Goodson	GY-Nor/Coltishall of GY	
73.	K	27.7.95	R George	Susanna	80	T George	Nor-GY of Nor	
74.	K	27.7.95	J Kemp	London Lady	35	T Shittlesborough	Nor-GY of Nor	
75.	W	28.7.95	S Mayhew	Active	35		Geldestone-GY of Geldestone	
76.	W	28.7.95	Wllm Holland	Waveney	20		Geldeston-GY	
77.	W	28.7.95	Wllm Holland (the elder)	Alert	33	George Holland (boy)	Geldestone-GY of Geldestone	

78.	W	28.7.95	J Wilkins	Industry	37		Coltishall-GY of Coltishall	
79.	W	29.7.95	J Cox	Mary	27	J Brown	GY-Beccles of Beccles	
80.	W	29.7.95	R Barcham	John	22	E Barrett	Beccles-GY of Beccles	
81.	W	30.7.95	J Riches	Land Provides	26		Salhouse-GY of Salhouse	
82.	W	31.7.95	J Francis	Active	16		Sutton-GY of Sutton	
83.	W	1.8.95	B Portes	Elizabeth	29		S Walsham-GY of S Walsham	
84.	W	1.8.95	Gazeley Kettle	Barleycorn	36		Coltishall-GY of Coltishall	
85.	W	3.8.95	S Thaxter	Coltishall	42		Coltishall-GY of Coltishall	
86.	W	3.8.95	J Chamerlain	Coltishall	38		Coltishall-GY of Coltishall	
87.	W	5.8.95	C Bull	Flora	34	J Holland	Oulton-GY of Oulton	
88.	W	7.8.95	E Luvock	Joy	30		Dilham-GY of Dilham	33
89.	W	7.8.95	E Wright	Adeoria	37		Horning-GY of Horning	20
90.	W	8.8.95	J Crane	Anson	22		Wroxham-GY of Wroxham	27

91.	W	8.8.95	R Ecclestone	Loddon	30		Langley-GY of Langley	
92.	W	8.8.95	B Mayes	James & Elizabeth	17		Sutton-GY of Sutton	
93.	W	8.8.95	J Ward	Friends Increase	20		Sutton-GY of Sutton	
94.	W	8.8.95	R Salmon	Hopewell	20		Catfield-GY of Catfield	28
95.	W	8.8.95	J Newstead	Friendship	21		S Walsham-GY of S Walsham	
96.	W	8.8.95	J Lovesick	Three Sisters	18		Aylsham-GY of Aylsham Bingle	
97.	W	8.8.95	G Luck	Defiance	42		Aylsham-GY of Aylsham	40
98.	W	10.8.95	J Holson	Hope	17	R Hobson (boy)	Horning-GY of Horning	20
99.	K	10.8.95	Wllm Ebbage	Trial	40	T Browne (boy)	Aylsham-GY of Panxworth	
100.	K	10.8.95	Wllm Houghton	Venture	20		Aylsham-GY of Panxworth	
101.	K	11.8.95	Permeter Ansell Jnr	Polly	80	Permeter Ansell Snr	GY-Nor of GY	
102.	No entry							
103.	W	12.8.95	Wllm Brundel	Profit	22		Nor-GY of Whitlingham	

104.	W	12.8.95	Thms Swann	Virgin	22	Nehnemiah Sparrow (boy)	Wroxham-GY of Wroxham	30
105.	W	12.8.95	John Richardson	Lark	14		Irstead-GY of Irstead	24
106.	W	12.8.95	Wllm Porter	Two Brothers	29		Langley-GY of Langley	
107.	W	12.8.95	Thms Prudy	Fair Trader	24	T Purdy Jnr (boy)	Dilham-GY of Dilham	30
108.	W	13.8.95	George Bowring	John & Ann	15		GY-Horning of GY	
109.	W	15.8.95	Thms Williams	Industry	25		Wroxham-GY of Wroxham	25
110.	W	15.8.95	James Thaine	Industry	20		Hickling-GY of Hickling	
111.	K	15.8.95	Henry Hastings	Elizabeth & Ann	80	F Ollett	GY-Nor of GY	
112.	W	15.8.95	James Amis	Sarah	14		Barton-GY of Barton	20
113.	W	15.8.95	Thms Staffy	Friends Adventure	14		Stalham-GY of Stalham	23
114.	W	16.8.95	Jsph Tooley	Fox	30		Salhouse-GY of Salhouse	23
115.	W	17.8.95	Robert Chase	Venus	15		Dilham-GY of Dilham	30
116.	W	17.8.95	J Macky	Pythoe	23		Wood Bastick-GY	24

117.	W	17.8.95	J Rous	Norfolk Farmer	30		Aylsham-GY of Aylsham	39
118.	W	17.8.95	Wllm Sago	Mayflower	16		Aylsham-GY of Aylsham	
119.	W	17.8.95	Barzella Goshing	James & Elizabeth	15	Wllm Cast (boy)	Reedham-GY of Reedham	9
120.	K	18.8.95	Elisha Royall	Two Friends	28	Henry Prep (boy)	Coltishall-GY of Coltishall	
121.	W	18.8.95	Robert Dingle	Thomas's Friendship	40	Wllm Dingle (boy)	Salhouse-GY of Salhouse	25
122.	W	19.8.95	James Willimite	Concord	18		Dilham-GY of Dilham	33
123.	W	19.8.95	George Brown	Providence	32	John Fenn (boy)	Bungay-GY of Bungay	40
124.	W	19.8.95	John Mills	Commence	47	Wllm Smith	Bungay-Gy of Bungay	
125.	W	22.8.95	John Balls	Endeavour	16	Richard Wean (boy)	Aylsham-GY of Irstead	
126.	W	22.8.95	Bery Chase	Farmer	25		Bungay-GY of Bungay	
127.	W	24.8.95	James Fiske	Little Mary	20	Thms Holland (boy)	Burgh St Peter-GY of Burgh St Peter	
128.	W	24.8.95	Bery Ward	Endeavour	50	George Mayhew	Bungay-CY of Bungay	
129.	W	27.8.95	Rob Blyth	Fancy	25		Horstead-GY of Horstead	25

130.	W	28.8.95	Isaac Cheapox	Two Brothers	30		GY-Nor of GY	
131.	K	28.8.95	John Rant	Success	97	Benjamin Harmes	GY-Nor of GY	
132.	W	28.8.95	Matthew Bidney	Endeavour	16		Aylsham Burgh-Nor of Aylsham Burgh	40
133.	W	29.8.95	John Mayhew	Betsey	25		Beccles-GY of Beccles	
134.	W	28.8.95	Rob Mayhew	Two Williams	29		Beccles-GY of Beccles	
135.	K	31.8.95	Wllm Goldsmith	Royal Oak	58	Henry Knights	Bungay-GY of Bungay	40
136.	W	4.9.95	Saul Smith	Hope	40	Dan Mills (boy)	Bungay-GY	
137.	W	5.9.95	John Knoghts	Liberty	18	Sam Darby (boy)	Bungay-GY of Bungay	
138.	K	7.9.95	Sam Betts	July Flowers	80	Wllm Brake	GY-Coltishall of GY	
139.	W	8.9.95	Clem Cook	Olive Branch	36	Charles Cook (boy)	Aylsham-GY of Aylsham	40
140.	W	12.9.95	Rod Adkins	Beeston	19		Irstead-GY of Barton	30
141.	W	17.9.95	Thomas Luster	Enterprize	30		Bungay-GY of Bungay	
142.	W	19.9.95	Benj Mumford	Providence	30		Upton-GY of Upton	13
143.	W	25.9.95	Charles Hall	Industry	17		Cantley-GY of Cantley	13

144.	K	3.10.95	Wllm Albrow	Conclusion	59	Wllm Layton	Reedham-GY of Reedham	9
145.	W	10.10.95	John Maidstone	Brothers	18	James Moore (boy)	Aylsham-GY of Aylsham	
146.	W	21.10.95	John Woods	John	18	John Moore (boy)	Herringfleet-GY of Herringfleet	10
147.	W	23.10.95	Wllm Spinks	Oxnead	18	John Moore (boy)	Oxnead-GY of Oxnead	
148.	K	29.10.95	Wllm Thomas	Quick Dispatch	45		Norwich, Coltishall-GY of GY	
149.	W	16.12.95	Stephen Darby	Geldestone	35	Joseph Layell	Geldestone-GY of Geldestone	35
150.	K	19.1.96	Robert Kett	Dolphin	50	Sam Betts	GY-Nor of GY	(32)
151.	K	25.1.96	Roger Page	Flora	57		GY-Nor of GY	(32)
152.	W	22.2.96	Grge Bowering	Nautilus	18	Grge Bowering Jnr (boy)	Ludham-GY of Ludham	(20)
153.	W	9.8.96	Wllm Selever	Fortitude	17		Nor-GY of Nor	30
154.	K	19.1.97	Rob Kett	Flora	57		GY-Nor of GY	
155.	W	7.5.98	Wllm Lilly	Royal George	16	G Dunn (boy)	GY-Nor of GY	
156.	W	19.1.98	Step Darby	Benjamin	10	Steoh Darby Jnr (boy)	GY-Geldestone	

Appendix III

As drawn from the Register of Vessels on Inland Waterways (1795):

Main river routes to Great Yarmouth:

Working distance in miles are as given in the Register of Vessels on Inland Waterways. Figures in brackets are distances in miles for the equivalent present route as given in the Norfolk and Suffolk Yachting Association Handbook for 1986, the Green Book.

S = Southern River N = Northern River

River	From	Wherries	Keels	Boats	Miles	
S Yare	Norwich	23	29		32	
S Yare	Langley	2				(14)
S Yare	Cantley	2			13	
S Yare	Hardley	1				(10.5)
S Yare	Reedham	1	1		9	(10)
Norwich & Coltishall		1	2			
Norwich & Aylsham		1				
N Bure	Aylsham	7	2		40	or 39
N Bure	Oxnead	1			36	
N Bure	Horstead	3			25	
N Bure	Coltishall	10	1		30	
N Bure	Wroxham	4			30	or 25 (26)
N Bure	Horning	4			20	(21)
N Bure/ Salhouse Broad	Salhouse	3			25	
N Bure	Wood Bastwick	1			24	
N Bure/ Ranworth Broad	Ranworth	1			24	
N Bure/ South Walsham Broad	South Walsham	3				
N Bure	Upton	1			13	
N Bure	Acle	2			12	
N Bure	Tunstall	1			10	
N Bure	Stokesby	1				
N Thurne	Hickling	2			24	or 23 (22.5)
N Thurne/ Hickling Broad	Catfield	1			28	
N Thurne	Sommerton	1			24	
N Thurne	Martham			1		
N Thurne	Potter Heigham	2			20	(17.5)
N Thurne	Ludham	1			20	

River	From	Wherries	Keels	Boats	Miles
N Thurne	Repps	1			
N Ant	Dilham	4			20 or 33
N Ant	Stalham	1		1	30 or 23
N Ant/ Sutton Broad	Sutton	5			30 (25)
N Ant/ Barton Broad	Barton (Turf)	1		1	20 or 30 (21.5)
N Ant	Irstead	2			24 (21)
S Waveney	Flixton	1			
S Waveney	Bungay	9	1		40
S Waveney	Geldestone	4			34 (23.5)
S Waveney	Beccles	4			30 (21)
S Waveney	Lowestoft	1			23 (17)
S Waveney/ Oulton Broad	Oulton	1			(14.5)
S Waveney	Burgh St Peter	1			(15.5)
S Waveney	Herringfleet	1			10
TOTALS:		116	36	3	

Main parent towns of vessels:

	Wherries	Keels	Boats
Great Yarmouth	9	21	
Norwich	14	9	
Carrow (Norwich)		1	
Coltishall	9	1	
Repps	1		
Martham			1
Horstead	2		
Sommerton	1		
Potter Heigham	2		
Hickling	2		
Dilham	6		1
Sutton	3		
Stalham	1		1
South Walsham	3		
Acle	2		
Bellaugh	1		
Norton	1		
Flixton	1		
Overton	1		
Wainford	2		
Lowestoft	1		
Horning	3		
Geldestone	6		

	Wherries	Keels	Boats
Ranworth	1		
Hokesby	1		
Tunstall	1		
Beccles	4		
Salhouse	3		
Oulton	1		
Catfield	1		
Aylsham Bingle	1		
Aylsham	5		
Aylsham Burgh	1		
Panxworth		2	
Whitlingham	1		
Wroxham	3		
Irstead	2		
Langley	2		
Barton	2		
Wood Bastwick	1		
Reedham	1	1	
Bungay	7	1	
Burgh St Peter	1		
Horstead	1		
Upton	1		
Herringfleet	1		
Oxnead	1		
Ludham	1		
Cantley	1		
TOTALS:	116	36	3

Appendix IV

The 1827 Act for making and maintaining a navigable communication for ships and other vessels between the City of Norwich and the Sea at or near Lowestoft in the County of Suffolk, schedule of harbour and river rates on cargoes:

For every quarter (containing eight bushels) of wheat, barley, malt, beans, pease, tares, canary, mustard, and other seeds, 3d
For every quarter of oats, 3d
Sack containing five bushels of flour, 2d
Quarter of meal, middlings, and sharps, 2d
Ditto of pollard and bran, 2d
Sack of clover, trefoil, and other heavy seeds, 3d
Ditto of potatoes, onions, etc, 1d
Bushel of apples, pears, etc, 1d
Bag of hops, 6d
Pocket of hops, 3d
Thousand of English oil cakes, 2s
Ditto of foreign ditto, 2s
Pack of wool, cotton etc containing 240 pounds, 4d
For every hundred weight of tanned hides, and calf skins, 2d
Raw hide, 1d
Hundred of pelts, 9d
Ton of tan or bark, 2s
For every ton of sugar, fruits, bacon, cheese, butter, pork, hams, tongues, salt, salted fish, tallow, soap, candles, and all heavy grocery goods, not here specified, 2s
Hundred weight of tea, coffee and spices, 3d
Chest of oranges, lemons, etc, 2d
Puncheon of molasses, 1s
Ale, cider, porter, perry, vinegar, and oil:
For every butt, 1s
Puncheon, 6d
Barrel, 4d
Kilderkin or runlet, 2d
Per dozen in hampers, 2d
Madder per cask, per cwt, 2d
Pipe clay, at per ton, 2s
Spirits and wines:
For every pipe or butt, 1s
Hogshead, 6d
Half ditto, 3d
Quarter ditto, 2d
Under 20 gallon at per gallon, 1d
Per dozen in hampers, 2d
For every four-wheeled carriage, 7s
Two wheeled carriage, 3s 6d
Horse, mare, or gelding, 3s 6d
Other beast, 3s
Coals etc:
For every chaldron (containing 36 bushels) of coal, coke, culm, cinders, or breeze, 2s

Hay and straw: For every ton of hay, cinquefoil, clover or straw, 2s
Timber and deals:
For every load of oak, elm, pine, beach, and fir timber, 2s
Load of deals, battens, and lathwood, 2s
Mahogany, etc:
For every cubic foot of mahogany, teakwood, or other valuable woods, 1d
For every ton of hemp, cordage, and yarn, 2s
Barrel of pitch, tar, grease, rosin, etc, 3d
Stone, slate, etc:
For every ton of stone, slate, plaster of Paris, alum, unwrought iron, bar iron, lead, etc, 2s
For every cubic foot of marble, 3d
1000 of gutter, pan, mathematical, and plain tile, 3s
1000 of bricks, and paving tiles, 4s
Crate of glass or earthenware, 9d
Carboy of vitriol or oil, 3d
Corpse, £1 1s
Organ, £1
Piano-forte, harpsichord, harp, or bass viol, 5s
100 pipe staves, 2s
for every ton of ballast, 1s
For bale goods, and all other articles, wares, merchandize, not specified in this schedule, according to the amount of freight, at per Cwt., 2d

Bibliography

Pictorial Material

Buck S & Buck N A South East Prospect of the City of Norwich. London, S & N Buck, 1741.

Butcher J A North West View of the Quay of Great Yarmouth. Great Yarmouth, J Butcher, 1790.

Corbridge J Mapp of the City of Norwich. Norwich, I Harris, 1727.

Corbridge J A South West Prospect of Yarmouth in the County of Norfolk. Norwich, J Corbridge, 1741.

Corbridge J The West Prospect of the Town of Great Yarmouth in Norfolk. Norwich, F Harris, 1742.

Hobrough J S Cubitt's Marsh (1895). Norwich, Bridewell Museum.

Hobrough J S Strumpshaw - Train Reach (1896). Bridewell Museum.

Hobrough J S Strumpshaw - Train Reach (1896). Norwich, Bridewell Museum.

Hobrough J S untitled (1890s). Norwich, Bridewell Museum.

Hobrough's Patent Depositor No. 10345. Norwich, Hobrough & Son, 1894.

King S The City and County of Norwich. London, S King, 1766.

Kirkpatrick T The Northeast Prospect of the City of Norwich. Norwich, E Kirkhall, 1723.

Preston I Fort and Mouth of the Yare. Great Yarmouth, I Preston, 1819.

Robberds J W Scenery of the Rivers of Norfolk, comprising The Yare, The Waveney, and the Bure from pictures painted by James Stark, with historical and geological descriptions by J W Robberds, Jun., Esq.. Norwich, John Stacey, 1834.

Swinden H Map of Great Yarmouth. London, S Pyle, 1779.

Manuscripts and printed ephemera

Fisher C. Norwich, unpublished, 198-.

Malster R. Lavenham, unpublished, 197-.

Turner R R A Compendious History of Yarmouth, 5 vols. Great Yarmouth, Great Yarmouth Library, 1790.

At Norfolk Record Office:

Accounts of goods 1780-1810. Norfolk Record Office, Yarmouth Pamphlets and Single Pieces, Y 942.61 (045), Great Yarmouth, 1810.

Ballast book for Great Yarmouth. Great Yarmouth Corporation Records, Y/C/26/72, Great Yarmouth, 1668-1669.

Bill of Sale of a two masted keel, Ms. 2166.

Collection of haven duty, Great Yarmouth Ballast Master and Water Bailiff's account audit books. Great Yarmouth Corporation Records, Y/C/27, Great Yarmouth, 1671-1832.

Draft Contract of James Bessey & James Hayn Bessey for supply of keels & wherries for removal of mud raised by steam & horse "didelling" engines and for supply of horses for horse engine. Norwich City Records 26(b), Records relating to Carrow Bridge, Norwich, 1830.

Harrison J H Account of Ballastage, supply of Land, etc., etc. Great Yarmouth Corporation Records, GY/C/26/74, Great Yarmouth, 1856.

Kirkpatrick J The John Kirkpatrick Manuscripts. Books of Pleas, Leet Rolls, Case 21 Shelf F Box II, Norwich, 1728.

Norfolk Railway Surplus Lands. Accounts of the Norfolk Railway, BR61/3/22/1-16, Norwich, 1850.

Plan of Rivers Wensum and Yare from Foundry Bridge to Burgh Flats. Norwich City Records, Case 16 Shelf E Bundle VI, No.82, Norwich.

Register of Vessels on Inland Waterways. Great Yarmouth Corporation Records, Great Yarmouth, 1795.

Seagoing tonnage and charges due to ships entering port of Yarmouth. Great Yarmouth Corporation Records, Y/C/26/60, Great Yarmouth, 1812-1814.

Seagoing tonnage and charges due to ships entering port of Yarmouth. Great Yarmouth Corporation Records, Y/C/26/64, Great Yarmouth, 1825-1826.

Seagoing tonnage and charges due to ships entering port of Yarmouth. Great Yarmouth Corporation Records, Y/C/26/65, Great Yarmouth, 1834-1835.

The Coal Journal. Great Yarmouth Corporation Records, Y/C/26/71, Great Yarmouth, 1733.

The Watermen's Society. Norwich City Records, Case 21 Shelf E Box 6, Norwich, 1787.

Tonnage Duty Receipts. Case 10 Shelf H Item 16, Great Yarmouth, 1726.

Parliamentary Papers

Act for extending the navigation of the River Bure. London, C Eyre & W Strahan, 1773.

Act for improving the Haven at Great Yarmouth. London, G Eyre & A Spottiswoode, 1835.

Act for making and maintaining a navigable communication for ships and other vessels between the city of Norwich and the Sea at or near Lowestoft in the County of Suffolk. Norwich, Brightwell, Newton & Parkinson, 1827.

Act for making the River Waveney navigable for Ships. Beccles, Sharpin, 1831.

Ant and Bure Canal Act. London, J Brettell, 1812.

Published Articles

Barringer J C "Faden and His Map", Norfolk Record Society, vol 42 1973)

Blake W M "The Norfolk Wherry", Yachting Monthly, vol LIV, No.321, (1933), pp.193-195.

Brindley H H "Norfolk Keels", Mariners Mirror, XII (1927), pp.99-100.

Cozens-Hardy B "Norfolk Coastal Defences in 1588", Norfolk Archaeology, Vol. XXVI (1936) pp. 310-314.

Douglas-Sherwood T "Report to the Norfolk Keel Recovery Action Group". Norwich, Norfolk Archaeological Diving Unit, 1984.

Frank J "Humber Keels", Mariners Mirror, 41 (1955), pp.308-328.

Frank J "Humber Keels Part II", Mariners Mirror, 44 (1958), pp.218-239.

Hudson H "On an Ancient Timber Causeway across the River Wensum at Fye Bridge, Norwich", Norfolk Archaeology, XIII (1898), pp.217-232.

McKee E "Identification of timbers from old ships of North-Western European origin", The International Journal of Nautical Archaeology 5.1 (1976), 3-1.

Ridgard C J "The Waveney Navigation 1670-1828", Diss Antiquarian Society Newsletter 21 (1982).

Vidler L A "The Rye River Barges", Mariners Mirror 21 (1935) pp.378 on.

Willan T S "River Navigation and Trade from the Witham to the Yare, 1600-1750", Norfolk Archaeology, 26 (1938), pp.296-309.

Books

Admiralty Manual of Seamanship 3 vols. London, Her Majesty's Stationery Office, 1964.

Allthorpe Guyton M John Thirtle. Norwich, Norfolk Museums Service, 1977.

Anderson R C & Anderson R The Sailing Ship. London, Harrap, 1980.

Blomefield F A History of Norfolk, 11 vols. London, W Bulmer, 1806.

Burwash D English Merchant Shipping 1460-1540. Newton Abbot, David & Charles, 1969.

Clarke R Black Sailed Traders, The Keels and Wherries of Norfolk and Suffolk. Newton Abbott, David & Charles, 1972.

Darroch E & Taylor B A Bibliography of Norfolk History. Norwich, The Centre for East Anglian Studies, 1975.

Christensen A E Inshore Craft of Norway. London, Conway, 1979.

Davis R The Rise of the English Shipping Industry in the 17th and 18th Centuries. Newton Abbot, David & Charles, 1962.

Defoe D Tour through the Eastern Counties. Republished Ipswich, East Anglian Magazine Ltd., 1949.

Finch R Coals from Newcastle Lavenham, Terrence Dalton, 1973.

Gombrich E H Art and Illusion. Oxford, Phaidon Press, 1980.

Harland J Seamanship in the Age of Sail. London, Conway, 1984.

Hudson & Tingey "Disputes concerning New Mills". In Selected Records of the City of Norwich. Norwich, Jarrolds, 1906.

Jarvis R "Ship Registry to 1707". In R Craig (ed) Maritime History, Vol.1, 4 vols, Newton Abbot, David & Charles, 1972, pp.29-45.

Laird Clowes G S Sailing Ships, their History and Development. As illustrated by the Collection of Ship Models in the Science Museum, London, HMSO, 1932.

Malster R Wherries and Waterways. Lavenham, Terrence Dalton, 1971.

March E J Inshore Craft of Great Britain in the Days of Sail and Oar. Newton Abbott, David & Charles, 1970.

McKee E Working Boats of Britain. London, Conway, 1983.

McKee E Clenched Lap or Clinker. London, National Maritime Museum, 1972.

Millican P The Register of the Freemen of Norwich 1548-1713. Norwich, Jarrolds, 1934.

Moore A W The Norwich School of Artists. Norwich, Norfolk Museums Service, 1985.

Nordbok A D The Lore of Ships. Gothenburg, Nordbok, 1975.

Norfolk and Suffolk Yachting Association Handbook for 1986: The Green Book. Norwich, Norfolk & Suffolk Yachting Association, 1986.

The Norfolk and Norwich Merchant's, Tradesman's, and Farmer's Complete Memorandum Book, for the Year of our Lord 1784. Norwich, J Crouse, 1784.

The Norfolk and Norwich Merchant's, Tradesman's, and Farmer's Complete Memorandum Book, for the Year of our Lord 1805. Norwich, Bacon, 1805.

The Norfolk and Norwich Merchant's, Tradesman's, and Farmer's Complete Memorandum Book, for the Year of our Lord 1819. Norwich, Burks & Kinnebrook, 1819.

The Norfolk and Norwich Merchant's, Tradesman's, and Farmer's Complete Memorandum Book, for the Year of our Lord 1834. Norwich, Matchet, Stevenson & Matchet, 1834.

Patterson A Through Broadland by sail and motor. London, Blakes Ltd, 1930.

Read H The Meaning of Art. London, Faber, 1977.

Simper R Beach Boats of Britain. Woodbridge, Boydell Press, 1984.

Suckling P A History of Suffolk. 6 vols, London, John Weale, 1848.

Underhill H A Sailing Ships, Rigs and Rigging. Glasgow, Brown, Son & Ferguson, 1978.

Unger R W The Ship in the Medieval Economy 600-1600. London, Croom Helm, 1980.

White E W British Fishing Boats and Coastal Craft: Historical Survey and Catalogue of the Collection. London, Science Museum reprint series, 1973.

Williams N J The Maritime Trade of the East Anglian Ports 1550-1590. Oxford University, unpublished D.Phil. thesis, 1952.

Wolfflin H The Principles of Art History. New York, Dover, 1950.

Wren W J Ports of the Eastern Counties. Lavenham, Terrence Dalton, 1976.