

Subsistence fishing at Jamestown, 1607–24

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SUMMARY: The early 17th-century colonists of Jamestown had limited success in exploiting the abundant marine resources of the James River and Chesapeake Bay. This paper reviews their knowledge of fishing skills and examines the different methods they used in an unfamiliar environment. It presents the major series of archaeological finds of fishing equipment from James Fort dating to 1607–24 and considers whether the colonists may have acquired skills from the local Virginia Indians. Finally, ecological factors, including the impact of a prolonged drought on fish stocks, are discussed.

INTRODUCTION

In the course of recent excavations at James Fort, Jamestown, Virginia, more than 200 pieces of fishing equipment have been recovered. This important assemblage is closely dated between the foundation of the fort in May 1607 and its abandonment in 1624, most of the finds dating from c. 1610. The following paper explores the context of these finds.

The paper seeks to shed light on the reasons that the early Jamestown colonists suffered from hunger while nearby rivers teemed with fish.¹ It is divided into five parts. The first includes a discussion of the fishing skills that the colonists may have had prior to leaving for the New World. The second assembles documentary evidence for the methods of fishing that they employed; the third examines the archaeological finds of fishing equipment from James Fort. The fourth assesses the impact of the Virginia Indians on the colonists' fishing practices; the fifth looks at environmental and geographical factors that affected the success of their fishing ventures.

RESOURCES

Both the James River and nearby Chesapeake Bay (Fig. 1) had rich marine resources including

numerous species of fish, shellfish and crustaceans. Writing in 1608, original colonist Captain John Smith described the 'abundance of fish lying so thick with their heads above water . . . Neither better fish, more plenty, nor more variety for small fish had any of us ever seen in any place so swimming in the water than in the Bay of Cheapeack'.² A few years later, colonist Ralph Hamor described the range of species: 'For fish, the rivers are plentifully stored, with sturgeon, porpoise, bass, rockfish, carp, shad, herring, eel, catfish, perch, flat-fish, trout, sheepshead, drummers, garfish, crevices, crabs, oysters and divers other kinds.'³

FISHING SKILLS

Some of the documents of the early years of Jamestown record successes in fishing. In the first year of the colony Smith wrote:

I tooke once 52 Sturgeons at a draught,⁴ at another 68. From the later end of May till the end of June are taken few, but yong Sturgeons of two foot, or a yard long. From thence till the midst of September, them of two or three yards long and few others. And in 4 or 5 houres with one Net were ordinarily taken 7 or 8: often more seldome lesse.⁵



FIG. 1

Jamestown and the Chesapeake Bay region (APVA).

Sturgeon — a fish which would have been regarded as a great delicacy in England — were a lifeline for the struggling colonists in 1609, when they were in desperate need of food. On one occasion in that year they caught 'more sturgeon than could be devoured by dog and man'.⁶ Such success stories, however, appear to have been uncommon, and other accounts indicate a lack of expertise in fishing. Smith's description of the abundance of fish in the Chesapeake, quoted above, is given in the course of his account of a curious incident during an exploratory trip in 1608 which suggests a striking lack of equipment and preparedness. Upon coming across large schools of fish but lacking nets, Smith's men attempted to catch them with a frying pan, which, he records, 'we found . . . a bad instrument to catch fish with'. He concludes the story with the words 'they are not to be caught with frying pans'.⁷ Two years later, in June 1610, when the settlers were once more in desperate need of food, they turned to fishing with nets but met with little success. William Strachey, the secretary of the colony at that time, commented: 'But let the blame of this lie where it is, both upon our nets and the unskillfulness of our men to lay them.'⁸ Many

years after the founding of Jamestown, John Smith remarked on their failures:

Now although there be Deere in the woods, Fish in the rivers, and Fowles in abundance in their seasons; yet the woods are so wide, the rivers so broad, and the beasts so wild, and wee so unskilfull to catch them, wee little troubled them nor they us.⁹

A request from the colonists to the Virginia Company in 1610 for 20 fishermen and six net-makers indicates that they recognized this lack of expertise.¹⁰

At first sight their poor skills seem surprising. Marine fishing had long been a major occupation in the numerous coastal communities of early modern England, and professional fishermen might have been an obvious source of fishing skills; it appears, however, that there were few such men among the early settlers. Little is known about the occupations of the majority of those who arrived in 1607; of those which are recorded, over 40 were gentlemen and between 28 and 31 were labourers and craftsmen.¹¹ Fishermen are rarely mentioned

in the early narratives. There is one exception: Smith's account of the exploratory trips around Chesapeake Bay in 1608 mentions a fisherman named Jonas Profit and a fishmonger named Richard Keale, although he also describes these men as soldiers.¹² Their combined knowledge of catching and keeping fish might have proved invaluable.¹³ It is, however, likely that they died in the early years of the colony: during the 'Starving Time' of the winter of 1609–10 only 60 of the estimated 500 colonists survived.¹⁴

A second group with fishing skills would have been mariners, who must often have supplemented their diet by catching fish on long voyages.¹⁵ Those who sailed to Jamestown may have had fishing equipment comparable to that found in the wreck of the *Mary Rose*, the flagship of Henry VIII which sank in 1545.¹⁶ There appear to have been strong incentives for English mariners to fish during a voyage, since they had the right to profit from the catch; they often received a share instead of wages.¹⁷ Indeed, there seem sometimes to have been no clear distinctions between sailors and fishermen, suggesting that their skills may have been interchangeable, or that men were skilled in both occupations. For example, a collection of documents dating to 1582 recording ships and seamen sometimes lists fishermen among the mariners.¹⁸

Two accounts illustrate that mariners were on occasion successful at fishing and carried the necessary equipment. First, while anchored in the James River off Jamestown in June 1607, the sailors provided the colonists with a 7ft (2m) sturgeon.¹⁹ Second, in 1614 the colonist Ralph Hamor was asked to provide the local Indian leader, Chief Powhatan, with fishing equipment. When trying to acquire this equipment he turned to a mariner named Captain Christopher Newport, requesting 'an hundred fishhooks or, if he could spare it, rather a fishing seine [net]'.²⁰

Unfortunately for the permanent settlers, mariners did not often stay long at Jamestown. The sailors on the first voyage left the settlement a little over a month after their arrival; their swift departure allowed little time for sharing fishing skills. The colonists did, however, retain the smallest ship, the pinnace *Discovery*, which would have been well suited to fishing.²¹ Its permanent presence makes it the more puzzling that the colonists were not more successful at fishing.

The many gentlemen who arrived in 1607 may have had experience of recreational fishing in England, as described, for example, by Leonard Mascall in 1590.²² This, however, would probably have been limited to hook and line fishing on small ponds and rivers — a far cry from using nets in the

large bodies of water of the Chesapeake region. Others who came from inland communities in England may have had little opportunity to learn to fish, since a number of laws restricted this activity. For example, a statute in Norfolk, East Anglia, forbade the purchase of fishing equipment by the majority of the populace: 'And that no man buy nets, hookes nor other instruments pertaining to fishing in the Countie of Norfolk, but lords, masters and mariners of ships, that use the mystery of fishing . . .'²³ A statute of 1608 prohibited fishing in ponds and moats without permission from the landowner; those guilty of the offence were liable to a prison term of three months or more.²⁴

Limited skills in fishing were compounded by lack of skill in maintaining equipment and preserving fish. In his description of the attempts at fishing in June 1610, William Strachey added: 'They suffered fourteen nets (which was all they had) to rot and spoil, which by orderly drying and mending might have been preserved. But being lost, all help of fishing perished.'²⁵

When the colonists did succeed in taking a sizeable catch, the excess fish evidently went to waste.²⁶ Hamor tells of an occasion in 1613 when enough fish were caught by net in Chesapeake Bay to sustain the colony for a year, but the fish could not be preserved, owing to a lack of salt.²⁷

The colonists' performance in fishing in the first years, in common with all other activities, must also have been severely hampered by their generally poor health, malnutrition and subsequent lack of energy.²⁸ For a period of five months there are said to have been only five men healthy enough to man the bulwarks of the fort against hostile Virginia Indians.²⁹ During such difficult times it is likely that fishing would have been restricted and perhaps would have been halted altogether.

DOCUMENTARY EVIDENCE FOR THE METHODS AND EQUIPMENT USED IN CATCHING FISH

Records of the early attempts at fishing at Jamestown sometimes mention the methods and equipment used. Several writers have claimed that the first colonists did not have adequate fishing gear.³⁰ Recent archaeological evidence, however, casts doubt on this claim, since numerous pieces of fishing equipment, indicative of a variety of practices, have been recovered (see below).³¹ Many years after returning to England, Smith included 'Nets, Hooks, and Lines' in a list of provisions that he thought that families and individuals should bring with them to Virginia in the 1620s.³² By that

time at least, such equipment was deemed essential for the sustenance of the colonists.

FISHING WITH NETS

Documentary references indicate that many of the colonists' attempts at fishing were with nets; the most commonly mentioned are seine nets. The seine consists of a net wall with a weighted bottom line and an upper line buoyed up by corks or wooden floats. Fish are trapped in the net as the two ends are pulled ashore or onto a boat or boats. During the warm months when the water temperature was tolerable the colonists could easily have used such nets by wading in shallow water, but during the winter seining would only have been possible from boats.

Net-making was a profession in early 17th-century England, and the skill and time needed to make such nets were reflected in their cost. A document which records the expenses entailed in supplying the *Margaret*, a ship bound for Virginia in 1619, mentions a 'saine or fishing net' purchased at the high price of £6 and a 'saine rope' costing 7s 5d.³³ It is possible that some colonists made nets upon arriving at Jamestown³⁴ but this would have required considerable expertise. The incident of 1614 described above, in which Ralph Hamor was asked to provide a seine net from Captain Christopher Newport 'if he could spare it'³⁵ indicates the scarcity of such nets, and suggests that the Indians were aware of their value. Typically they were made of hemp twine, a material subject to decay, as the colonists found in 1610.³⁶

The rivers around Jamestown presented unexpected hazards to this type of fishing. Their shores were lined with large trees which fell or eroded into the river. In the early 17th century the river bottoms had not been dredged or cleared, presenting numerous underwater obstacles which could snag and tear nets. The poor condition of the nets mentioned by Strachey in 1610 may reflect damage by such obstructions. In 1613 Reverend Alexander Whitaker, a minister near Jamestown, commented:

The rivers abound with fish both small and great . . . whereof we catch many and should do more but that we want good nets answerable to the breadth and depth of our rivers, besides our channels are so foul in the bottom with great logs and trees that we often break our nets upon them.³⁷

FISHING WITH ROD AND LINE

A second obvious method of catching fish was by rod and line, with fishhooks and weights. Smith

sheds light on the practice during the first few years of the colony: 'In the small rivers all the year there is a good plenty of small fish, so that with hooks those that would take pains had sufficient'³⁸ This kind of fishing will have been conducted in shallow water or from the shore, using a wooden pole. The gentleman Anthonie Parkhurst described his success with this method in late 16th-century Newfoundland: 'There be also other fishes . . . that I take as fast as one would gather up stones, and them I take with a long pole and hooke.'³⁹ Reels had not come into use in early 17th-century England; because there was no apparatus for winding up excess line, the length of the line attached to the pole would have been restricted. These relatively short fishing lines were often made from the hair of horses' tails. Thus the use of a rod or pole would have severely limited the range of fishing.

HAND LINES

An alternative to fishing with rod and line was the hand line and hook; this allowed the fisherman to reach greater depths and distances. The line was simply hung from a wooden frame, onto which it was later wound up. When used from a boat, hand lines needed to be longer than the depth of the water.⁴⁰ The excess length allowed the weight and hook to remain stationary on the bottom, presenting an easier target for scavenging fish. Lines were probably made of hemp,⁴¹ which would have been much stronger than those made from horses' tails, and better suited to catching the larger fish in the Chesapeake region. Unsurprisingly, neither hand lines nor wooden rods have survived in the archaeological record at Jamestown.

Weights were necessary to sink the line to the required depth; the colonists used lead for this purpose. Lead fishing weights were referred to as 'plummets' by Mascall in 1590, and different weights were chosen to suit the size and strength of the line. He also described the use of corks with lead sinkers to pursue fish that did not feed on the bottom, allowing the hook to be suspended at various depths above it.⁴²

WEIRS

Finally, the settlers built fishing weirs or traps: 'weares for fishing' were mentioned by Smith.⁴³ These were common on rivers and estuaries in much of England, and would probably have been familiar to many of the colonists prior to their leaving England.⁴⁴ They would have been well suited to a tidal estuary like the James, and to fast-flowing rivers. The local Virginia Indians also employed this method of fishing.

ARCHAEOLOGICAL EVIDENCE FOR FISHING AT JAMESTOWN

The archaeological evidence from the James Fort site (1607–24) contains a sizeable quantity of more than 200 artefacts related to fishing. These include fishhooks, net weights, and weights suitable for use with hook and line.⁴⁵ Significant amounts of fish bone have also been uncovered from early fort contexts.⁴⁶ Seventeen different fish species have so far been identified (Fig. 2); further species are likely to be represented in the collections, since many faunal remains from recent excavations have not yet been analysed.⁴⁷ Among the material which has been studied are thousands of bones of sturgeon, the fish most commonly recorded in the early accounts of the settlement. The combined material

evidence of fishing equipment and fish remains shows that the early Jamestown settlers were indeed equipped for fishing.⁴⁸ These finds also offer significant new evidence about their fishing methods.

FISHHOOKS

Over 170 fishhooks have been excavated at the fort, mostly from the earliest archaeological deposits dating to 1607–12. All but one are of iron; they vary considerably in size. Those that retain their terminal end (the end of the hook which fastens to the fishing line) are not pierced with a hole like most modern hooks, but are flattened into a spade shape to allow for attachment to the line. Those hooks that retain their points preserve, or show

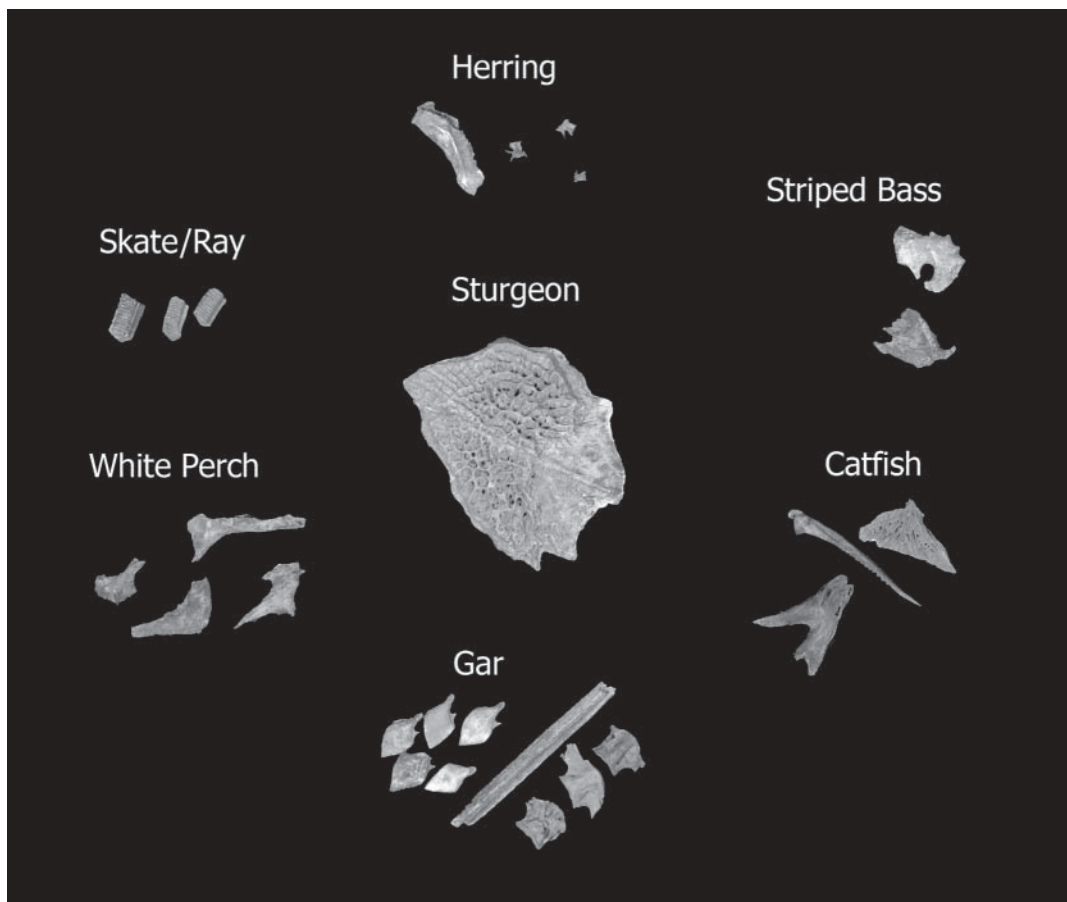


FIG. 2

A sample of local fish species found in early 17th-century features at James Fort (APVA).

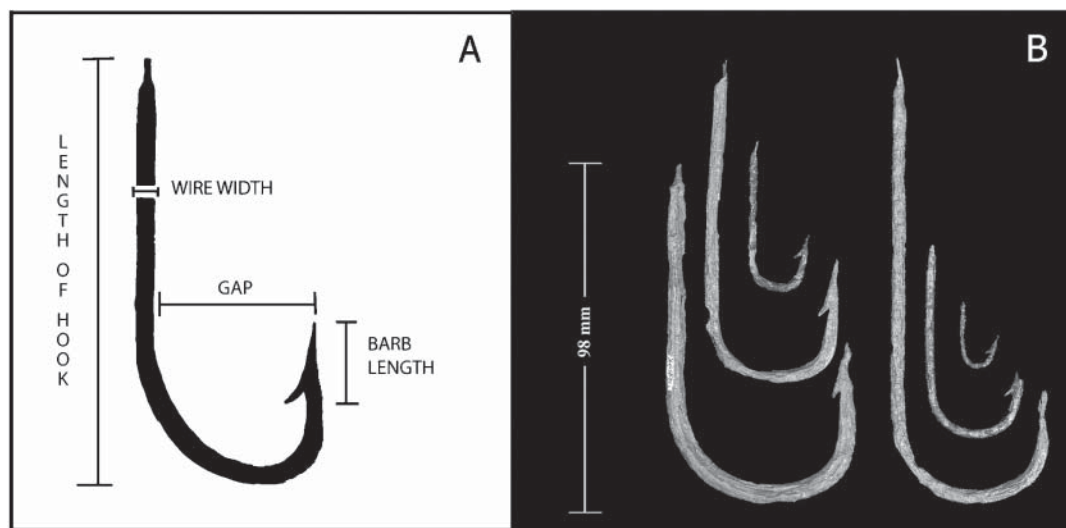


FIG. 3

Fishhook attributes and photo of iron fishhooks found at James Fort (APVA).

evidence of, barbs. Measurements of the dimensions of the fishhooks were recorded from the X-rays of 34 examples from two of the earliest archaeological contexts.⁴⁹ Several of these are over 100mm long, with some as large as 130mm, but there are also smaller examples only about 40mm in length (Fig. 3). The dimensions of these hooks are presented in Table 1.

The largest hooks, over 100mm in length with a gap measurement of over 30mm, are not suitable for catching the vast majority of the fish species in the James River, whose mouths are far too small for them. They would therefore have been of little use for subsistence fishing in the immediate vicinity of the colony. These large hooks might have been more useful in Chesapeake Bay, where fish such as shark occasionally venture. It seems more probable that the colonists were hoping to catch larger offshore fish such as cod, which would have been familiar to Englishmen from their exploitation of the northern Atlantic and Newfoundland. This may suggest that the Virginia Company hoped to exploit similar resources in Virginia; the impracticality of using large hooks locally may explain why they were thrown away. The smaller hooks, less than 60mm in length with gap measurements under 20mm, would have been much more suitable for catching local fish. The sample of hooks from the fort may therefore be biased towards the types which were of little use locally; those which were

better suited to local requirements may have been lost during fishing, thus failing to appear in deposits within the fort.

Some of the fishhooks excavated at Jamestown are complete and probably retain their intended shape, preserving their points and barbs along with their terminal ends. A sample of 34 X-rayed fishhooks from Jamestown was studied by the writer, including twelve with all the elements of their original shape; this sample is not necessarily representative of the entire collection from the site. The presence of the complete hooks in trash pits in the fort, distant from the places where they would have been used, is curious. The largest ones may have been discarded because they were unsuitable for local fishing, as suggested above. The others may reflect a lack of care for hooks. If not cared for, the iron wire of fishhooks will soon rust in the damp climate of the Chesapeake region, particularly after use in saltwater. Once rust sets in, a fishhook becomes useless, losing its sharp point.⁵⁰ Strachey's description of lack of care of nets has been quoted above; this may have extended to other fishing gear such as hooks and lines.⁵¹

Some complete but bent fishhooks have also been excavated. Their condition may reflect damage from underwater obstructions, discussed above. The iron ones, particularly the smaller ones which are made from wire only 2–3mm thick,

TABLE 1
Fishhook attributes from James Fort

Context number	X-ray number	Condition of hook	Length (mm)	Gap (mm)	Width of wire (mm)	Length of barb (mm)
JR158N	X358	Incomplete (broken in two)	105		4	18
JR158R	X385	Incomplete (no terminal)	47	17	3	15
JR158R	X385	Incomplete (no point)	70	18 est.	3	
JR158R	X385	Complete	117	36	4	19
JR158S	X403	Complete	96	33	4	18
JR158V	X403	Complete (bent under stress)	118	46 est.	4	23
JR158AP	X409	Incomplete (no terminal)	117	47	6	20
JR158V	X411	Incomplete (both ends)	58	25 est.	2.5	
JR158R	X414	Complete	130	41	5	21
JR158D	X418	Incomplete (no terminal)	46	17 est.	3	14 est.
JR158F	X437	Complete (bent under stress)	83		3	17
JR158AP	X450	Incomplete (no terminal)	45	18	2.5	10
JR158AZ	X457	Incomplete (no terminal)	53	17	2.5	11
JR158AW	X561	Incomplete			4	17 est.
JR158AQ	X565	Complete	62	18	3	13 est.
JR158AD	X575	Complete	55	16	2	13 est.
JR158AV	X576	Incomplete			3	15
JR158R	X474	Complete	131	42	5	16
JR158R	X474	Complete	60	16	2	13
JR158R	X474	Complete	52	12	2	9
JR158R	X474	Incomplete	115	38 est.	5	17 est.
JR158R	X474	Incomplete	43	20	3	15
JR158BY	X474	Incomplete (broken bard)	43	18 est.	3	16 est.
JR158AP	X476	Complete	50	12	2.5	12
JR158AP	X476	Incomplete (bent open)			3	
JR158AP	X476	Incomplete			3	
JR158AP	X476	Incomplete			2.5	
JR158AP	X476				3	14
JR158AP	X476	Complete	60	16	2.5	11
JR158AP	X476	Complete	59	16	3	14
JR731B	X499	Complete	69	22	3.5	15
JR731B	X499	Complete	68	22	3.5	16
JR731B	X499	Incomplete (broken terminal)	66	22	3.5	15
JR731B	X518	Complete	66	21	3.5	16 est.

could have been bent easily. Various incomplete examples are also present in the sample; these may have broken in fishing, through corrosion, or during the excavation process. It is likely that more of the hooks were complete when discarded but have been broken subsequently, since they are fragile once corrosion has begun.

While the hooks vary in size, the gauge of the wire from which they are made is surprisingly regular; when measured in units of 0.1mm, most of the wires were found to be 2.0, 2.5, 3.0, 4.0, 5.0 or 6.0mm thick. This suggests that the wire was

drawn using standardized drawplates and was not merely the result of improvisation; it seems likely that it was produced professionally in England. The sizes of the hooks also show some standardization. Four from one context, JR731B, were almost identical in length, gap distance, barb length and wire width.⁵² Such uniformity suggests specialization on the part of the maker, suggesting production of the finished hooks by a professional in England. There are 46 fishhooks in this context, although not all are complete or have been X-rayed. The discovery of so many in a single context

suggests that they were stored and thrown away together, perhaps because they had rusted.

Whilst nearly all the fishhooks are of iron and are roughly the same shape, there is one interesting exception. A double hook of copper alloy was found in the backfilled cellar of structure 165; it was broken in two but the pieces were found close to one another. Thirty of the other X-rayed fishhooks were found in the same context. Mascall's *Book of Fishing with Hooke & Line* of 1590 depicts a double hook of the same shape (Fig. 4). Hooks of this form were made simply by folding and bending a single piece of wire.⁵³ The choice of copper alloy is interesting. It was understood in medieval Europe that plating a hook with copper made it resistant to corrosion.⁵⁴ The material of the double hook was clearly intended to do the same.

This form of hook was used in England during the 17th century to catch pike, an aggressive freshwater fish with sharp teeth. Mascall also depicts a live baitfish on a double hook.⁵⁵ In his book *Barker's Delight: or, the Art of Angling* (1657), Thomas Barker comments on the use of the double hook for pike fishing and mentions the use of live fish for bait:

If there be Pikes: for the hooks, they must be doubled hooks, the shanks should be somewhat shorter than ordinary: my reason is, the shorter the hook is of the shank, it will hurt the live Fish the lesse, and must be armed with small wyre⁵⁶

Barker's phrase 'armed with small wyre' refers to the protection of the line from the pike's teeth by adding a wire between the hook and the fishing line. One of the fish species identified in the early archaeological record at Jamestown is the pickerel, a member of the pike family.⁵⁷ Whitaker mentions catching pike with his angle [i.e. his fishhook] in 1613 when he names some of the freshwater fish caught in the James River.⁵⁸ The double hook found at Jamestown may never have caught pickerel or pike, but its presence shows a degree of fishing specialization on the part of at least one of the colonists. It may have belonged to a gentleman who had fished for pike in England before coming to Jamestown.

It has been suggested that the fishhooks used at Jamestown were provided in bulk from London. In the early 17th century hooks could have been

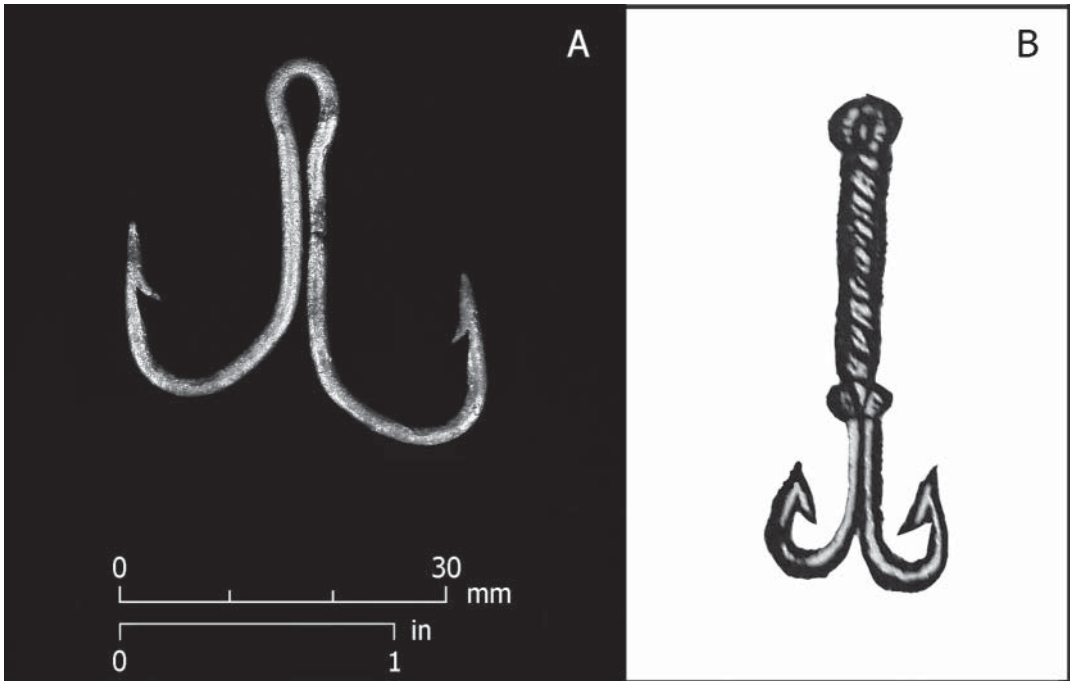


FIG. 4

(A) Copper-alloy double hook from early James Fort feature (APVA); (B) image of double hook from Leonard Mascall's *A Book of fishing with Hooke & Line* (1590), 24.

bought from tackle shops or from professional hook makers.⁵⁹ If need be, however, a blacksmith could easily forge hooks.⁶⁰ A blacksmith named James Read was listed among the first people at Jamestown.⁶¹ In 1614 English colonists struggling to survive on the island of Bermuda turned to the improvisation of a blacksmith to make fishhooks, 'for want of hookes and lines, the Smith made hookes of old swords'.⁶²

LINES

Although not evident in the archaeological or documentary record, organic fishing lines must have been an essential component of the fishing equipment of the colonists. They will have required skilled maintenance; if not thoroughly dried after use and cared for when in store they would rot quickly.⁶³ Since the early colonists were unable to care adequately for their nets and hooks, it is likely that they would also have had trouble maintaining their fishing lines, which were equally vulnerable to the elements.

WEIGHTS

Nearly 40 lead fishing weights have been found at James Fort. They fall into two main groups: large weights suitable for use on nets, and smaller weights suitable for fishing with hook and line (Fig. 5).⁶⁴ The first group (Type A) consists of large tubular sinkers around 60mm in length, cast in two-piece moulds.⁶⁵ Their large borehole diameters of over 18mm, capable of taking sizeable ropes, suggest that they were used with large seine nets. The uniform size of Type A weights suggests production by specialist craftsmen, probably in England (Table 2).

A second group (Type B) consists of smaller tubular seine net weights formed by hammering a flat sheet of lead into a tube. These are around 30mm in length — much smaller than Type A. A third group (Type C) consists of four wrought oblong-shaped weights, each with an irregularly drilled small borehole (less than 4mm in diameter) which would have allowed only small cords to pass through; these are probably net weights. The weights of types B and C were crudely made and could have been produced at Jamestown from scrap lead. The tubular or oblong shape of all the net weights would have allowed them to move freely along the bottom as the nets were dragged to shore.

The documentary evidence quoted above shows that nets were used to catch sturgeon. The species identified in Jamestown's archaeological record include other fish that were probably

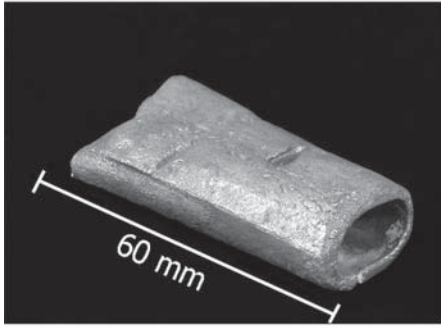
caught in seine nets, among them herring and shad, whose mouths are too small to bite most fishhooks; nowadays these fish are commonly caught with nets.⁶⁶ The presence of seine net weights, and of these two species in the archaeological record, suggests that seine nets played an important role in fishing at the fort.

A fourth group (Type D) consists of small ovoid weights, cast in two-piece moulds. Three of them are nearly identical, weighing around 22g, with the same shape and borehole size (5mm), suggesting controlled manufacture, probably by specialist craftsmen. It is unclear whether these weights were used on nets or with hook and line. Type D weights resemble sliding weights that are commonly used today by hook and line anglers. A fifth form of lead sinker (Type E) is the 'bullet weight', made by drilling a hole through a musket ball.

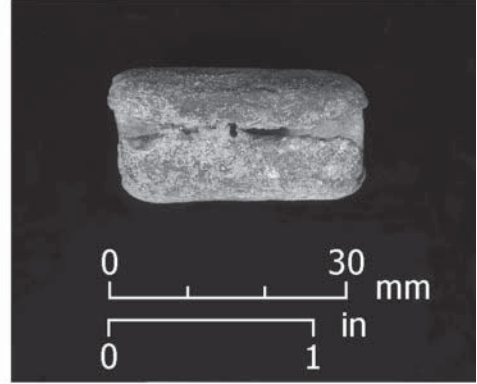
A few lead sinkers were also found; these will have been used in fishing with hook and line. One such weight (Type F) was large and conical, and weighed 235g. This would have been suitable for fishing in deeper water with strong currents, where its weight and shape would have allowed it to anchor near the bottom, keeping the bait and hook more stationary. This large weight would have been used on a long hand line run out from a boat.

Another weight which may have been used with hook and line had been made by cutting a large tubular seine net weight in half (Fig. 6). This weight had been crimped in the middle, which may be evidence of a 17th-century angler collapsing the tube to pinch the lead weight onto a fishing line. It is possible that this weight was modified after the seine nets had decayed in 1610, leaving the lead weights to be salvaged for other purposes. The conical weight and the modified tubular weight may show that the colonists fished with hand lines in deeper water.

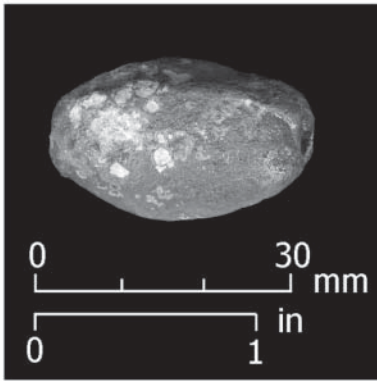
The weights and hooks found at Jamestown that were used in hook and line fishing appear to have been targeting the bottom-feeding species of the benthic zone. The analysis of the fish species represented in the faunal collection from Jamestown Fort supports this conclusion, benthic feeders being most common. Bottom fishing with hook and line appears to have been popular in the Chesapeake throughout the 17th century. An analysis by Henry Miller of fish remains from 24 households in the Chesapeake region dating between 1620 and 1750 found that fish species that feed near the surface or in open water, such as bluefish and sea trout, were absent from the archaeological assemblages. Most of the fish species he identified were benthic feeders, reflecting the predominance of bottom-feeding



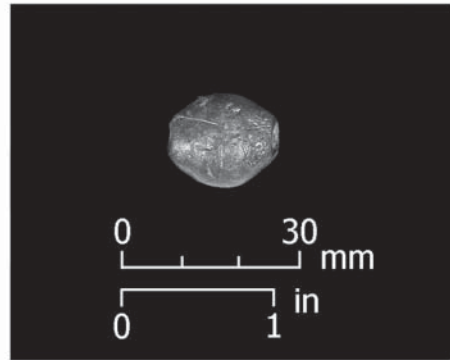
Type A



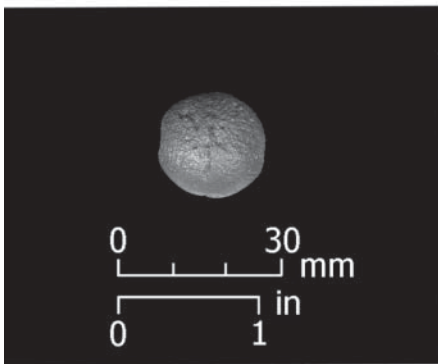
Type B



Type C



Type D



Type E



Type F

FIG. 5
Types of fishing weight of lead found at James Fort (APVA).

TABLE 2
Measurements of fishing weights from James Fort

Type of weight	Form	Context Number	Weight (gm)	Bore diameter (mm)	Length (mm)
A	Cast	JR1101H	212	18.3	61.8
A	Cast	JR558A	129	est. 19	64.1
A	Cast	JR275A	129	est. 18.6	64
A	Cast	JR558A	121	est. 17.8	59.1
A	Cast, modified	JR1795G	74	est. 18	32
B	Wrought	JR158B	51	7.2	30.4
B	Wrought	JR348A	49	7.3	33.9
B	Wrought	JR158R	39	11	30.6
C	Wrought	JR158AZ	43	est. 2	31.1
C	Wrought	JR158P	49	est. 3.5	29.3
C	Wrought	JR158AP	41	est. 3.8	29.2
C	Wrought	JR349A	37	est. 2.4	26.6
D	Cast	JR94C	22	5.3	17.7
D	Cast	JR158V	22	5.1	17.7
D	Cast	JR158AZ	22	5.3	18
E	Cast	JR514B	33	7	17.8
F	Cast	JR1795G	235	3.1	

fishing.⁶⁷ Bluefish and sea trout are also absent from the list of species identified so far at James Fort.

IMPACT OF THE VIRGINIA INDIANS ON THE COLONISTS AND FISHING

Before their arrival, the colonists and the Virginia Company in London knew from the experience of earlier English attempts at settlement that they would depend to a large degree upon Native Americans for food and local knowledge, including fish and fishing skills. On several occasions in 1607 Smith speaks of trading for fish with local tribes on exploratory trips.⁶⁸ In a letter from Jamestown in 1608, colonist Francis Perkins tells of learning to fish from the Virginia Indians: 'Their own great emperor . . . has sent us some of his people, that they may teach us how to sow the grain of this country and to make certain tools with which they are going to fish.'⁶⁹ Here Perkins is probably speaking of fishing weirs or nets; Strachey describes the Indians making these of reeds and grasses.⁷⁰

Strachey's accounts suggest that some of the fishing techniques used by the Virginia Indians resembled those of the English. These included the use the small rod with line and fishhook, but with a hook of bone rather than iron.⁷¹ They also impaled fish with arrows and spears: 'They use long arrows

tied in a line, wherewith they shoot at fish in the rivers. Those of Accowmack use staves like unto javelins headed with bone. With these they dart fish swimming in the water'.⁷² When in 1608 John Smith's men were fishing with their swords they may have been mimicking the actions of the Virginia Indians.

Strachey's detailed accounts of the fishing practices of the Indians demonstrate that the colonists were indeed watching and most probably learning from the subsistence techniques of their neighbours; they could have learned about the seasonality and locations of fish, or the techniques and types of bait good for fishing in the region. Strachey observed the exceptional fishing skills of the local Indians: 'In these hunting and fishing exercises they take extreme pains. Yet they being their ordinary labors from their infancy, they place them amongst their sports and pleasures, and are very proud to be expert therein'.⁷³

During times of hostile relations between colonists and Native Americans, exchange in fishing knowledge would presumably have ceased; at these times it became dangerous for the colonists even to venture outside their fort. This no doubt contributed to the colonists' failure to secure fish stocks when they were starving. Their fishing equipment, especially the weirs, would also have been vulnerable to attack, as the Roanoke colonists had found in 1586.⁷⁴



FIG. 6

Modified lead fishing weight found at James Fort (APVA).

RELATIVE ENVIRONMENTAL AND GEOGRAPHICAL FACTORS

Environmental and geographical factors posed unfamiliar problems to the Jamestown colonists. The sheer scale of the rivers and the bay evidently proved difficult to master, as Whitaker's comment that 'we want good nets answerable to the breadth and depth of our rivers' indicates.⁷⁵ At Jamestown, and for many miles upstream and downstream, the river is over a mile wide — far wider than the rivers of southern England.

The particular pattern of seasonality of fish in the Chesapeake would also have had an impact on catches. Many of the fish species are migratory and spend part of the year at sea, coming into the bay and its tributaries to spawn. The James River and the bay are richest in fish from spring to fall; fish numbers and the variety of species are lowest during the winter months. The early colonists had evidently learned some of the seasonal behaviour of local fish, as a comment by Strachey demonstrates: 'in March and April are great shoals of herrings . . . Sturgeon great store, commonly in

May, if the year be forward . . . And they remain with us June, July, and August'.⁷⁶

The seasonal migrations of fish are never dependable or predictable, but the colonists may have had particular problems in understanding fish behaviour because the fish were responding to a severe drought. An analysis of tree-ring data found that the period from 1606–12 was the driest seven-year period in 770 years; this period coincided with the first six years of the Jamestown colony.⁷⁷ It would have had a serious impact both on farming and fishing. Fresh and salt waters meet in the James River around Jamestown Island, forming brackish water which supports a unique ecosystem with a mix of fresh and saltwater fish species. Extreme drought conditions during the first years of the colony would have raised local salinity levels by reducing freshwater discharge into the river.⁷⁸ Recent salinity measurements conducted by the Chesapeake Bay Program at a water-quality monitoring station off Jamestown Island from 1998 to 2003 demonstrated the impact of drought conditions on salinity levels in the

river.⁷⁹ For much of 2001 and 2002 south-eastern Virginia experienced severe drought conditions. Salinity levels off Jamestown peaked during this period, reaching an average of 12.4 parts per thousand (ppt) in December 2001 — almost twice the average of the previous three Decembers.⁸⁰ Salinity levels in the James River at Jamestown from 1606 to 1612 are likely to have risen in a similar manner.

This historic spike in salinity may have disrupted the sturgeons' migratory pattern. In 1607 Smith attributed the survival of the colony to the sturgeon catch: 'From May to September, those that escaped lived upon sturgeon, and sea-crabs.'⁸¹ They were once more the staple food in the crisis of 1609, described above. In the spring of 1610, however, when the colonists were coming out of the 'Starving Time' and still in desperate need of food, Strachey says that, 'there was not one eye of sturgeon yet come into this river'.⁸² It is likely that high salinity levels at Jamestown will have driven the resident species of freshwater and brackish fish upstream, closer to the freshwater tributaries of the river. This would have been especially difficult for the colonists during the autumn and winter months, when many migratory saltwater fish leave the James River and the bay for the ocean, usually leaving only a handful of permanent brackish water species. Even the estuarine fish are driven to deeper waters by the colder water temperatures of winter months, where they would have been even more difficult to pursue.⁸³

It must have been unfortunate that fish were most plentiful during the warmer months, when they were most likely to spoil quickly.⁸⁴ The colonists' shortage of salt has been described above. Smoking might have offered an alternative means of preserving the catch, but no record of this practice survives. Sun-drying would have been another way to preserve fish, but the high summer humidity and damp summer spells typical of the Chesapeake region may have rendered this method impractical.⁸⁵ Thunderstorms are a feature of the Chesapeake climate; the failure of a fishing expedition when it met stormy weather during late summer in 1607, described by Smith,⁸⁶ is likely to have been one of many such incidents. The importance of observing climate changes and seasonal changes prior to embarking on a fishing trip may have been understood by those colonists with more fishing experience. In 1657 Barker writes that,

A man that goeth to the River for his pleasure, must understand, when he commeth there, to set forth his Tackles. The first thing he must do, is to observe the Sun, the Wind, the Moon, the Starres, and the Wanes of the

Air; to set forth his Tackles according to the times and seasons; to goe for his pleasure, and some profit.⁸⁷

CONCLUSIONS

The first Englishmen at Jamestown clearly suffered from their inability to catch and preserve sufficient fish. There is some evidence that they had poor fishing skills, but other factors may have contributed more to their failures: the unpredictability of the fish migrations arising from exceptional climatic conditions; poor maintenance of fishing equipment, and inadequate supplies of salt to preserve fish, alongside the general problems of the dangers of disease and their vulnerability to attack. The first decade of fishing by the Jamestown colonists appears to have been a period of trial and error. Over time they slowly learned to exploit local fish better. A document written in the late 1620s records, 'amongst those Plantations above James Towne, they have now found meanes to take plentie of fish, as well with lines as nets'.⁸⁸

NOTES

¹ Kupperman 1979, 24.

² Smith 1998b, 262.

³ Hamor 1998, 817.

⁴ *Oxford English Dictionary*. 1989, *sub* 'draught, *n.*'⁸⁷ gives 'the quantity of fish taken in one drawing of the net'.

⁵ Smith 1986c, 103–4.

⁶ Smith 1998b, 320.

⁷ Smith 1998b, 262.

⁸ Strachey 1998, 434.

⁹ Smith 1631, 6.

¹⁰ Anon. 1890, 469–70.

¹¹ Noël Hume 1994, 121.

¹² Kelso & Straube 2004, 178.

¹³ Haskett-Smith 1916, 5. Neither man can be traced; a list of members of the Worshipful Company of Fishmongers dating between 1600 and 1650 does not mention Richard Keale, but it is incomplete.

¹⁴ Kupperman 1979, 24.

¹⁵ Rule 1982, 197.

¹⁶ Rule 1982, 197.

¹⁷ Andrews 1982, 254.

¹⁸ Andrews 1982, 253.

¹⁹ Archer 1998, 117.

²⁰ Hamor 1998, 837.

²¹ Noël Hume 1994, 160.

²² Mascall 1590.

²³ Anon. 1890, 185.

²⁴ Anon. 1890, 608, 186.

²⁵ Strachey 1998b, 441.

- ²⁶ Wharton 1957, 3.
²⁷ Hamor 1998, 817–18.
²⁸ Noël Hume 1994, 160–1.
²⁹ Percy 1998, 100.
³⁰ Wharton 1957, 3; Pearson 1942, 353.
³¹ Kelso & Straube 2004, 180.
³² Smith 1910, 609.
³³ Anon. 1933, 183.
³⁴ Smith 1986a, 212.
³⁵ Hamor 1998, 837.
³⁶ Steane & Foreman 1991, 95.
³⁷ Whitaker 1998, 743.
³⁸ Smith 1998b, 104.
³⁹ Parkhurst 1600, 133.
⁴⁰ Steane & Foreman 1991, 89–90.
⁴¹ Steane & Foreman 1991, 92.
⁴² Mascall 1590, 23.
⁴³ Smith 1986a, 263.
⁴⁴ Salisbury 1991, 76.
⁴⁵ Kelso & Straube 2004, 180–1.
⁴⁶ Kelso & Straube 2004, 180.
⁴⁷ Bowen & Andrews 2000. The fish species so far identified include Shark, Skake/Ray, Sturgeon, Gar, Herring, Shad, Sucker, Catfish, Pickerel, Codfish, Sunfish, White Perch, Yellow Perch, Striped Bass, Grouper, Snapper, and Sheepshead.
⁴⁸ Kelso & Straube 2004, 180.
⁴⁹ All measurements are from the scaled X-rays of 34 fishhooks. The X-rays revealed the true metal of the fishhook parts and therefore provided accurate measurements. These fishhooks come from two cellars backfilled around 1610.
⁵⁰ Lewers 1972, 65. Even today's steel fishhooks are past salvation once corrosion sets in.
⁵¹ Strachey 1998, 441.
⁵² See Table 1; these four hooks were from context JR731B.
⁵³ Lewers 1972, 63.
⁵⁴ Steane & Foreman 1991, 90.
⁵⁵ Mascall 1590, 24.
⁵⁶ Barker 1657, 10.
⁵⁷ Bowen & Andrews 2000, 7.
⁵⁸ Whitaker 1613, 743.
⁵⁹ Trench 1974, 38; Hurum 1977, 37.
⁶⁰ Steane & Forman 1991, 101.
⁶¹ Smith 1624b, 228.
⁶² Smith 1624a, 358.
⁶³ Dowden 1995, 21–2.
⁶⁴ See Table 2. Measurements were taken from fishing weights that had undergone conservation.
⁶⁵ Kelso & Straube 2004, 181.
⁶⁶ Murdy *et al.* 1997, 67–78.
⁶⁷ Miller 1986, 176–9.
⁶⁸ Smith 1998a, 146, 150.
⁶⁹ Perkins 1608, 134.
⁷⁰ Strachey 1998, 633, 639.
⁷¹ Strachey 1998, 639.

- ⁷² Strachey 1998, 639.
⁷³ Strachey 1998, 640.
⁷⁴ Lane 1979, 302.
⁷⁵ Whitaker 1998, 743.
⁷⁶ Strachey 1998a, 684.
⁷⁷ Blanton *et al.* 1998, 564.
⁷⁸ Prugh *et al.* 1992.
⁷⁹ The Chesapeake Bay Program, a partnership of leading environmental agencies, documents progress in the environmental quality of the Chesapeake Bay watershed.
⁸⁰ Chesapeake Bay Program.
⁸¹ Smith 1998b, 230.
⁸² Strachey 1998b, 419.
⁸³ Murdy *et al.* 1997, 4.
⁸⁴ Wharton 1957, 3.
⁸⁵ Wharton 1957, 3.
⁸⁶ Smith 1998a, 149.
⁸⁷ Barker 1657, 1.
⁸⁸ Barnet *et al.* 1910, 885.

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ABBREVIATIONS

- APVA Association for the Preservation of Virginia Antiquities

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