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Taphonomy and Fish Bones from an Enslaved African American Context at Poplar Forest, Virginia, USA

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ABSTRACT: Faunal remains from a subfloor pit at Poplar Forest, Virginia, USA are identified. A fine-screen recovery program resulted in the retrieval of over 35,000 largely modified bones and teeth from less than one-third of a cubic meter of fill. Fish remains from this antebellum enslaved African American feature are analyzed with a focus on taphonomic influences. Fill deposits with pH above 7.0 facilitated excellent bone preservation and the observation of extensive gnawing of fish bone by commensal rats (*Rattus* sp.) and mice (*Mus musculus*) that would likely have escaped notice on less well preserved bones. Extensive gnawing on archaeologically recovered fish remains and modern experiments with wild brown rats indicate that a large portion of the fish fauna may have been consumed by rodents. Calculations of allometric relationships between bone dimensions and live fish size show that small, Number 3, Atlantic mackerel (*Scomber scombrus*) and large, poor, Atlantic herring (*Clupea harengus*) served as provisions for the slaves while the enslaved African Americans themselves likely caught the small freshwater catfish and minnows from local streams.

KEYWORDS: POPLAR FOREST, SUBFLOOR PIT, SLAVE DIET, FISH BONE, TAPHONOMY

RESUMEN: Se identifican restos faunísticos en el subsuelo de una fosa en Poplar Forest, Virginia, EE.UU. Un programa de recuperación exhaustivo ha permitido recuperar más de 35,000 huesos y dientes, en su mayoría alterados, en apenas un tercio de metro cúbico de relleno. Los restos de pescado, procedentes de la época de esclavitud previa a la Guerra Civil Americana, fueron analizados con especial énfasis en los aspectos tafonómicos. Los depósitos de relleno, con pH superiores 7.0, posibilitaron una excelente conservación de los restos óseos, que permitió detectar huesos de pescado roídos por ratones (*Mus musculus*) y ratas comensales (*Rattus* sp.). Estas piezas hubieran pasado desapercibidas en colecciones con peor estado de conservación. El gran número de mordiscos en los restos de pescado arqueológico, así como datos de experimentos realizados con ratas silvestres, indican que una gran parte de la ictiofauna de Poplar Forest pudo haber sido consumida por roedores. Los cálculos de las relaciones alométricas entre las tallas de los huesos y de los peces vivos, evidencian que pequeñas caballas (*Scomber scombrus*), y arenques (*Clupea harengus*) algo mayores sirvieron de alimento a los esclavos. Es más probable que los esclavos hayan pescado el pequeño bagre de agua dulce y los pececillos que podrían encontrarse en los arroyos de los alrededores.

PALABRAS CLAVE: POPLAR FOREST, SUBSUELO DE FOSA, DIETA DE LOS ESCLAVOS, HUESOS DE PESCADO, TAFONOMÍA

INTRODUCTION

Antebellum foodways among enslaved African Americans in the southern United States differed depending upon such factors as how owners organized their labor forces and plantation position on the landscape. Slaves organized into gangs were often provisioned by their owners while those organized into task groups were typically encouraged to generate some of their own food (Morgan, 1988: 213). Plantation owners located near seaports or navigable rivers could take advantage of relatively inexpensive preserved fish (e.g. Betts, 1953: 187) while those positioned inland necessarily relied more heavily on domestic mammals and birds. Provisions could vary by season, especially on large plantations where rationing was complicated (Gray, 1958: 564). Additionally, biases in both the historic and archaeological records have contributed to a less than clear view of enslaved African American foodways.

HISTORICAL OVERVIEW

Poplar Forest plantation is located in the foothills of the Blue Ridge Mountains about 20 kilometers southwest of Lynchburg in Bedford County, Virginia (Figure 1). Currently operated as a public historic site by a non-profit corporation, the National Landmark property has sponsored archaeological research for more than twenty years. While much of the research has focused on Thomas Jefferson's tenure from 1773-1826, recently the sites associated with antebellum slavery during the post-Jefferson period have come under increasing scrutiny. This paper examines faunal remains recovered from a subfloor pit associated with a slave cabin occupied from circa 1840 to 1860 during a period when William Cobbs owned the property and his son-in-law, Edward Sixtus Hutter, managed it.

Unlike Jefferson, who had divided the plantation into quarter farms with resident populations at each, Cobbs and Hutter centralized residential and work areas near the main house, which they and their families shared. The enslaved work force was divided into domestic servants and field hands, with some fluidity between roles, so that individuals working as domestics one year might find themselves in the fields the next. Several people were hired out regularly between the 1830s and 1860 to work on neighboring plantations, in Lynchburg, and farther afield (Lee, 2008: 165-166). The percentage of leased slaves exceeded those who worked in the Poplar Forest fields in 1854.

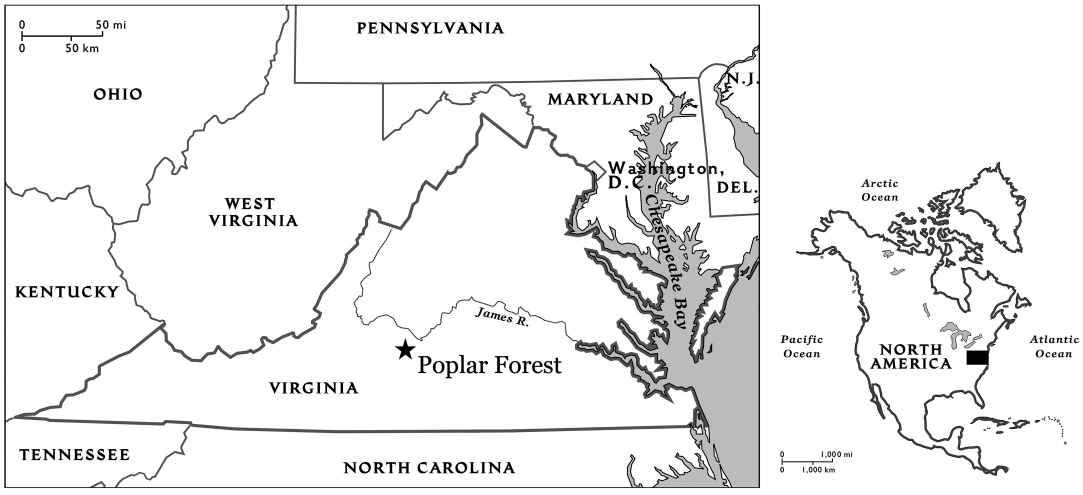

FIGURE 1

Map showing location of Poplar Forest near the James River, Virginia, USA (adapted from www.nationalgeographic.com/xpeditions).

SUB-FLOOR PIT

The remains of one of the Hutter period cabins consisted of features including a one-meter-square (three-foot-square) subfloor pit. Subfloor pits are commonly associated with colonial and federal-period slave quarters throughout Virginia, and are believed to have been dug by enslaved occupants to provide storage space for foodstuffs and personal belongings, or used ritually (Kelso, 1984; Samford, 1996, 2007; Neiman, 2008). Their presence on antebellum Virginia sites is less common, a phenomenon that has been explained by changing ideology among planters that impacted slave housing, sanitation, and storage methods (McKee, 1992; Vlach, 1995: 119-121).

Excavation of the pit revealed a total of 11 layers and lenses within the pit fill, suggesting that the feature was filled in discrete dumping episodes. For the most part, the layers were thickest at the pit edges and sloped downwards towards the center, where they were significantly thinner. Artifact analysis indicates that filling took place over a very short period of time.

The uppermost surviving layer of the feature was cut away by plowing. A significant part of the layer was also impacted by later rodent disturbance and twentieth-century gardening activities that took place at the site. The top layer of fill sealed a lens of sandy loam and ash, a rodent burrow, and a layer of mixed loam and clay that comprised 26% of the pit fill and measured up to 21.4 cm (0.7 foot) in thickness. It sealed a series of sloping layers of fill atop lenses of silty clay. Near the bottom of the pit, a second thick deposit was uncovered, measuring up to 24.4 cm (0.8 foot) and containing a hard rubber comb that dates no earlier than 1851. Part of this layer rested on subsoil, and part sealed two thin lenses above subsoil. Overall, most modern artifacts found in the upper levels of fill, date to earlier than 1858.

THE FAUNAL REMAINS

Slightly over 35,000 (i.e. 35,214) animal bones and bone fragments were recovered from 299 liters of deposits in this subfloor pit feature from enslaved African American context (Table 1). Faunal remains were transported to the University of Tennessee, Knoxville where they were identified with the aid of a 11,000 plus comparative skeletal collection housed in the Department of Anthropology. Taxonomy follows that found in Page & Burr (1991), Robins & Ray (1986), and Reid (2006).

Taxa	NISP
Osteichthyes*	
marine fish	
Clupea harengus (Atlantic herring)	3
Opisthonema oglinum (Atlantic thread herring)	1
Clupeidae (herring)	47
Scomber scombrus (Atlantic mackerel)	70
Scombridae	1
freshwater fish	
Anguilla rostrata (American eel)	5
Semotilus atromaculatus (creek chub)	1
Nocomis raneyi (bull chub)	1
Nocomis sp. (chub)	2
Campostoma anomalum (central stoneroller)	1
Luxilus sp. (shiner)	1
Cyprinidae (minnow)	23
Ameiurus natalis (yellow bullhead)	2
Ameiurus platycephalus (flat bullhead)	1
Ameiurus sp. (bullhead)	16
Noturus insignis (margined madtom)	7
Noturus sp. (madtom)	3
Ictaluridae (catfish)	1
Total fish	186
Amphibia	
frogs/toads/salamanders	18
Reptilia	
turtles/lizards/skinks	14
Aves	
domestic birds	255
native birds	47
Total birds	302
Mammalia	
domestic mammals	226
native mammals	706
Old World rats/mice	927
Total mammals	1,859
TOTAL IDENTIFIED SPECIMENS	2,379

*unidentified fish remains include 1,330 scales, spines, ribs, rays, and small fragments.

TABLE 1

Vertebrate remains (NISP) from Poplar Forest, Virginia.

Inferences about subsistence patterns derived from archaeologically recovered faunal remains depend, in large measure, on recovery methods and other taphonomic variables. Here we consider chemically well preserved, but mechanically modified, bony fish (Osteichthyes) remains from a ca. 150-year-old subfloor pit feature. In addition to

recovery methods, other taphonomic agents monitored include: deposit pH, rodent gnawing, carnivore gnawing, digestion, root etching, burning (both blackened and calcined), and butchering marks.

Fish remains recovered from the pit feature belong to two families of marine fishes (Clupeidae, herring; Scombridae, mackerel) and three families of freshwater fishes [Anguillidae, American eel; Cyprinidae, minnows; and Ictaluridae, bullhead catfishes (Figure 2)].

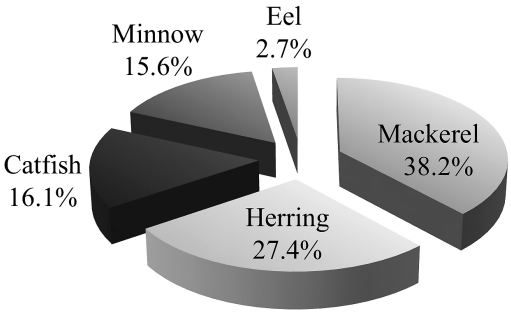

FIGURE 2

Two thirds (N=122) of the fish bones identified to family from Poplar Forest are those of marine taxa; i.e. mackerel (Scombridae) and herring (Clupeidae). Freshwater fishes include catfish (Ictaluridae), minnows (Cyprinidae), and eels (Anguillidae).

Marine Fish

Two-thirds (66%) of the fish remains identified to family are from marine species (i.e. Scombridae and Clupeidae). All except one of the scombrid bones compare favorably with Atlantic mackerel (*Scomber scombrus*) while clupeids are most similar to Atlantic herring (*Clupea harengus*), although one Atlantic thread herring (*Opisthonema oglinum*) was also identified.

Reference to preserved fish in the diets of enslaved African Americans in the Southeast is common. Autobiographies, biographies, slave narratives, account records, and the history of fisheries literature mention salt herring in particular (e.g. Grandy, 1844: 17; Steward, 1857: 11; Ball, 1859: 17,34; Earll, 1887: 435; Brown, 1941: 12; Scott, 1941: 262; Betts, 1953: 187; Katz, 1968: 30; Henson, 1969: 19; Pennington, 1971: 65; Muse, 1976: 216; Kelso, 1986: 32; O'Leary, 1996: 130; Heath, 1997: 3). Other sources refer to a general «salt fish» (Hall, 1829: 224; Johnson, 1930: 85; Woofter, 1930: 30) while still others refer specifically to mackerel (King, 1828: 526; Calloway, 1941: 173; Joyner, 1984: 91; O'Leary, 1996: 123). In his *Maine Sea Fisheries: The Rise and Fall of a Native Industry, 1830-1890,* O'Leary (1996: 123) notes that «The Virginia Tidewater river ports were the focus of much of this Chesapeake fish trade. During the two decades preceding the Civil War, shipments from such places in Maine as Eastport, Rockland, and Westport, as well as Portland, were sent by schooner to Richmond, on the James River, and Alexandria, on the Potomac. The cargoes were of an assorted nature, combining smoked or pickled herring and dried cod with potatoes … Maine's antebellum coastwise commerce included the shipment of salt mackerel to ports as far south as Savannah …».

During the mid-nineteenth century barreled herring and mackerel were commonly advertised in Chesapeake tidewater cities like, Alexandria and Baltimore as well as Richmond on the James River. On 24 December 1854, for example, the *Richmond Daily Whig* notes «A great many small mackerel in market, and but few large … The supply of good fish is small. A great many condemned fish have been brought into market this season, sold at from 1.5 to $3».

Mackerel, in particular, were graded by size and condition. Number 1 mackerel had to be free of taint, rust or damage, «and when split, not less than 13 inches [330 mm] from the extremity of the head to the crotch or fork of the tail». No. 2's differed only in that they were not less than 11 inches [279 mm]. Mackerel that were in poor condition and not of the best quality were graded No. 3 large (not less than 13 inches [330 mm]); No. 3 (not less than 10 inches [254 mm]); and No. 3 small (all others) (State of Maine, 1871). Number 3 mackerel were relatively inexpensive and were frequently sold for slave rations (King, 1828: 526; Joyner, 1984: 91; Otto, 1984: 57). In September 1848, the *Baltimore Market*, for example, listed herrings for $4.25, No.1 mackerel at $11, No. 2 mackerel at $7, and No. 3 mackerel from $4 to $4.25 a barrel.

Mackerel remains from Poplar Forest consist primarily of vertebrae (N=50). Of these, 6 are abdominal, 11 are caudal, and 33 are too fragmented to determine their position in the vertebral column. Other mackerel bones include a maxilla fragment, a parasphenoid, a scapula, and a pterygiophore. Fifteen fragments are too incomplete to identify. Regression equations for ten of the bones

in Atlantic mackerel have been generated on Tennessee's modern comparative collections (Klippel & Sichler, 2004). Unfortunately, the mackerel used in deriving those regressions were from fish significantly larger than those recovered from Poplar Forest. Additionally, bones measured by Klippel & Sichler (2004) are too fragmented in the Poplar Forest assemblage to permit measurement; many are rodent gnawed and at least one maxilla was cut in two (see *Butchering* below) in the process of splitting the fish down the back before salting. As a result, small «bait» mackerel were obtained from Boston, Massachusetts and new regression-based allometric formulae were generated for bones that could be used to estimate fork length on mackerel from Poplar Forest (i.e. abdominal vertebrae and maxilla greatest anterior height – Table 2). Abdominal vertebrae are presented here because, in any given fish, they are less variable in size and fewer in number (N=8, excluding the «atlas») than caudal vertebrae (N=22). Graphs and linear regressions were generated on data strings having no empty cells using *Excel 2003* (Microsoft Corporation, Redmond, WA) with the Visual Basic Analysis (VBA) add-in.

The overwhelming majority of the mackerel remains from Poplar Forest are from No. 3 mackerel; two of the abdominal vertebrae indicate No. 3 «small» mackerel (<10 in. [254 mm]) while three measurements provide estimates for No. 3

A. Descriptive statistics for modern comparative specimens

Taxon (Length)	N	Mean	SD	Min	Max
Scombridae (FL)	68	305.88	46.35	245	399
Clupeidae (TL)	55	186.33	88.96	80	304
Ictaluridae (TL)	35	246.43	79.40	62	400

Measurements in mm
FL=fork length; TL=total length

B. Regression coefficients for modern comparative vertebrae and maxillae

Element by taxon	Meas.	N	Mean (SD)	Intercept	Slope	SE	R^2
Scombridae							
abdom.vert.	gr.ant.w.	68	4.86 (0.82)	34.109	55.953	7.738	0.973
maxilla	gr.ant.ht.	68	5.44 (1.07)	80.314	41.485	12.669	0.926
Clupeidae							
abdom.vert.	gr.ant.w.	55	2.52 (1.04)	-28.299	85.264	8.924	0.990
Ictaluridae							
abdom.vert.	gr.ant.w.	35	3.80 (1.49)	50.619	51.474	21.096	0.932

Measurements in mm
gr.ant.w.=greater anterior width; gr.ant.ht.=greater anterior height

C. Descriptive statistics for estimated length of historic fish

Taxon (Length)	N	Mean	SD	Min	Max
Scombridae (FL)	5	252.66	11.35	236	262
Clupeidae (TL)	22	259.70	29.87	219	332
Ictaluridae (TL)	8	192.6	14.8	178	225

Measurements in mm
FL=fork length; TL=total length

TABLE 2

Statistics for modern comparative fish skeletons and fish bone from Poplar Forest, Virginia.

«standard» mackerel (>10 in., [254 mm] but less than 11 in., [279 mm]). A single cut maxilla is from a No. 2 mackerel (>11 in., [279 mm] but less than 13 in., [330 mm]). Figure 3 shows the regression for anterior widths of abdominal vertebrae. Standard deviations for any two measurements do not overlap which suggests at least two mackerel are represented by the six measurements taken on the Poplar Forest material (abdominal vertebra anterior width 3.60 mm, estimated fork length 236 ± 46.4 mm; maxilla anterior height 5.8 mm, estimated fork length 320 ± 46.2 mm).

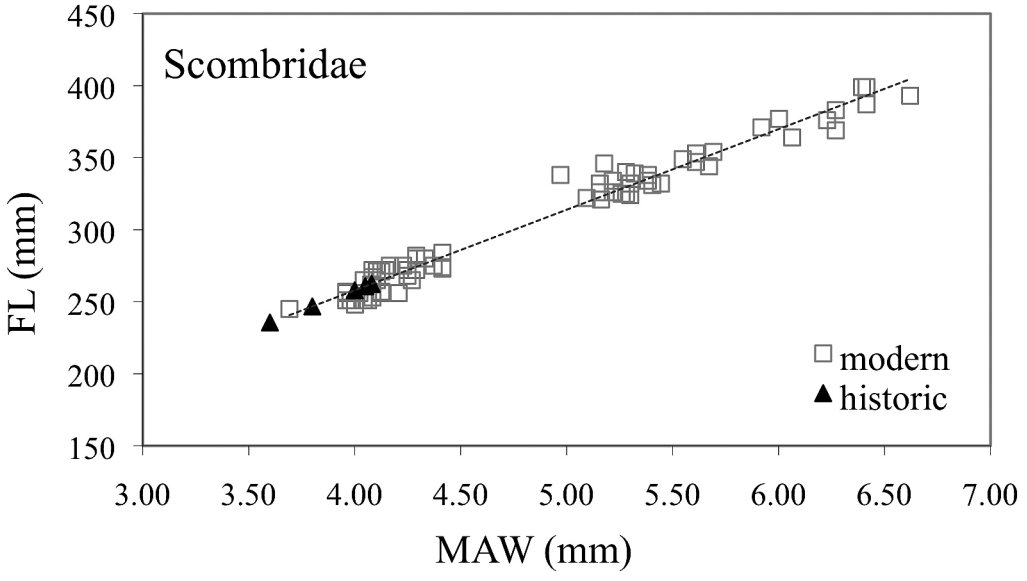

FIGURE 3

Mean anterior width (MAW) of Scombridae abdominal vertebrae plotted against fork length (FL). Measured specimens include modern *Scomber scombrus* (N=68) and Atlantic mackerel vertebrae (N = 5) from Poplar Forest, VA (solid triangles).

Herring were the second most common of the fish remains from the pit feature. Like mackerel, the most abundant elements recovered from herring were vertebrae. A single dentary, a penultimate vertebra, and an ultimate vertebra were from Atlantic herring (*Clupea harengus*); one postemporal was from an Atlantic thread herring (*Opisthonema oglinum*). The remaining vertebrae compare most favorably with those of Atlantic herring, but are referred to as clupeids in Table 1. Of these, 22 from Poplar Forest were abdominal vertebra complete enough to measure. Regressions for abdominal vertebra were generated on modern Atlantic herring (*Clupea harengus*) and scaled sardines (*Harengula jaguana*) in Tennessee's comparative collections. Sardines are included here to accommodate the smaller clupeids from Poplar Forest [see Desse & Desse-Berset (1996) and Van Neer *et al*. (2005) for precedent of including divergent genera in the same regression]. Fifty-five modern Atlantic herring and scaled sardines were available for measure (Table 2a). Mean abdominal vertebra anterior width from the modern specimens was used to estimate total length (Table 2b) of herring whose remains were recovered from Poplar Forest (Figure 4). Archaeologically recovered vertebrae from Poplar Forest were from herring between 22 cm and 33 cm long (i.e. 9-13 inches).

Not unlike Atlantic mackerel, Atlantic herring were often graded according to size, condition, and how they were processed. Prices of number two herring, although potentially larger than scaled herring, were often less than half as expensive as «scaled» herring. Between 1830 and 1850, for example, the average price for half-bushel boxes of smoked herring realized by fishermen was $1.10 for scaled herring, 80 cents for number ones, and 35 to 40 cents for number twos (Earll,

1887: 483). After 1822, «scaled herring» were the top grade; they were fat, had their scales removed, were well cured (smoked) and were at least 7 inches (17.5 cm) long (Earll, 1887: 481). Number one herring were well cured (smoked), but not scaled, and were at least six inches (15 cm) in length (Earll, 1887: 481); «… number twos were the poor fish of various sizes including those from the Magdalen Islands» (Earll, 1887: 480). «The spawning season at the Magdalen Islands lasted for three to five weeks, running from approximately the last week of April until June 1. It was during this period that the fish came near shore and could be easily captured in nets or seines» (O'Leary, 1996: 108). Although fat depleted as a result of spawning, herring from the Magdalen Islands in the Gulf of St. Lawrence were generally larger than those taken on the American coast (O'Leary, 1996: 1009). Between 1845 and 1865, Eastport and Lubec vessels, «as well as those from other portions of the coast, visited the Magdalen Islands and secured cargos of herring…» (Earll, 1887: 475). As noted above, during the two decades preceding the Civil War, shipments of herring from places like Eastport, Maine were sent by schooner to Richmond, Virginia on the James River (O'Leary, 1996: 123).

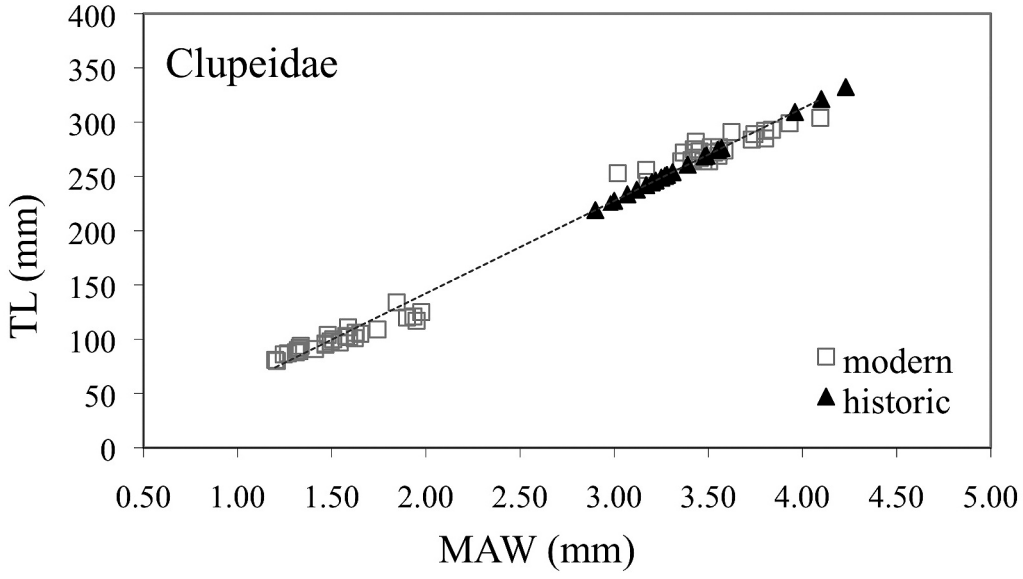

FIGURE 4

Mean anterior width (MAW) of Clupeidae abdominal vertebrae plotted against total length (TL). Measured specimens include modern *Clupea harengus* (N=28) and *Harengula jaguana* (N=26); Clupeidae vertebrae (N=22) from historic Poplar Forest, VA (solid triangles).

Unfortunately, the different grades of herring are challenging to differentiate on the basis of archaeologically recovered remains, and while it is not possible to tell if the relatively large herring from Poplar Forest represent «poor» number two herring from places like the Magdalen Islands, Earll (1887: 476) has noted that herring ranging from six (15 cm) to nine (22.5) inches in length «… have always been thought more desirable than larger ones, and have commanded a better price in the market». This suggests that, although «scaled» and number one herring were in excess of six/seven inches (15/17.5 cm) long, they were generally not appreciably larger than nine inches (22.5 cm) in length. Herring from Poplar Forest are estimated to have been longer than nine inches (>22.5 cm) and could well represent relatively inexpensive number 2 herring.

Freshwater Fish

The American eel is one of the few fish that migrates from freshwater to oceans to spawn (Jenkins & Burkhead, 1994: 207). As a result, eels occupy a wide diversity of habitats from cold mountain streams to open estuaries. While dam construction on the James River, starting in 1795, has greatly reduced eel numbers above the Fall Line, a number of records exist from the 1900's for even the upper reaches of the James River, suggesting the construction of Bosher Dam near Richmond in the late eighteenth century did not completely stop elver upstream migration and would not have precluded eels from occurring in the creeks near Poplar Forest during the 1800's.

Minnow remains from the subfloor pit minimally include those of creek and bull chubs (*Semotilus atromaculatus* and *Nocomis raneyi,* respectively), central stonerollers (*Campostoma anomalum*), and shiners of the genus *Luxilus*. All are generally less than 20 cm (ca. 8 inches) total length (Jenkins & Burkhead, 1994: 301, 311, 371, 374, 377, 379) and although not limited to creeks and streams as defined by Jenkins & Burkhead (1994: 48) all occur in these habitats and were probably present in the creeks around Poplar Forest in the mid-eighteen hundreds. Slave Narratives for the Southeast note catching minnows (Elder, 1941: 308; Henderson, 1941: 5; McIntosh, 1941: 81) … «from cricks and rills round the plantation» (Willbanks, 1941: 140); Willbanks (1941: 140) also mentions catching eels.

Catfish remains belong to two genera; bullhead catfishes (*Ameiurus* spp.) that are medium-sized catfishes ranging up to 450 mm (18 inches) in total length (Jenkins & Burkhead, 1994: 538), and madtoms (*Noturus* spp.) that generally do not exceed 120 mm (4.8 inches) in length (Jenkins & Burkhead, 1994: 557). The abdominal vertebrae from 35 modern bullheads that belong to four species of *Ameiurus* (i.e. *A. catus, A. natalis, A. nebulosus,* and *A. platycephalus*) were used to estimate the sizes of Poplar Forest bullheads. Mean anterior widths of abdominal vertebrae from these comparative specimens ranged from 62 mm to 400 mm total length (mean = 246 mm). Bullheads from Poplar Forest are estimated to have ranged between 178 mm and 225 mm (Table 2c, Figure 5).

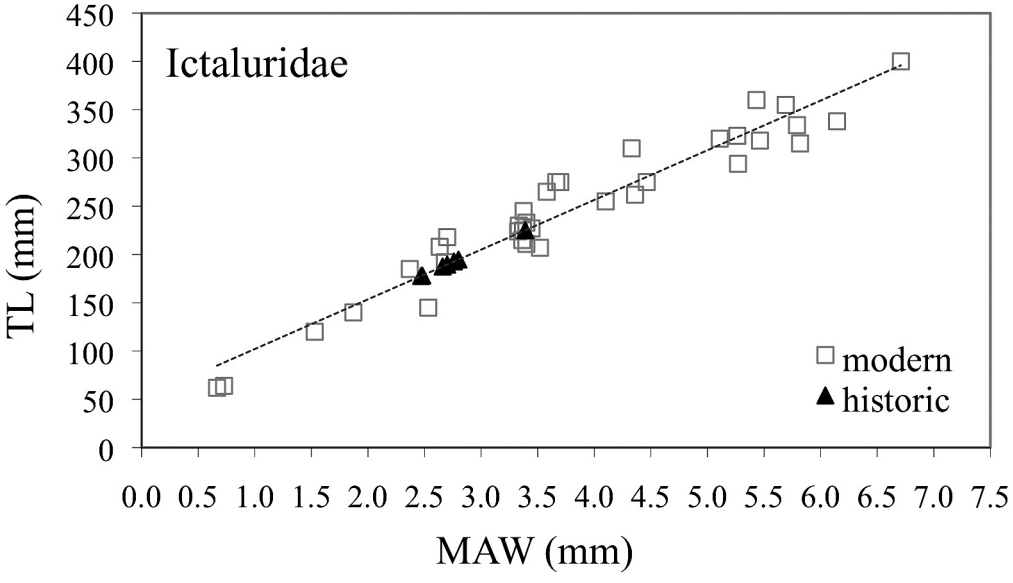

FIGURE 5

Mean anterior width (MAW) of Ictaluridae abdominal vertebrae plotted against total length (TL). Measured specimens include modern *Ameiurus brunneus* (N=1), *A. catus* (N=11), *A. natalis* (N=8), *A. nebulosus* (N=13), and *A. platycephalus* (N=2) and Ictaluridae vertebrae (N=8) from historic Poplar Forest, VA (solid triangles).

TAPHONOMY

Taphonomic agents can modify animal bones to the extent that faunal remains have little to contribute to archaeological interpretations (Heath, 2008). Recovery techniques are often considered a part of taphonomic pathways affecting credible interpretations (Gifford, 1981: 387; Lyman, 1994: 5). Here we consider: recovery, deposit pH, gnawing and digestion, butchering, and root etching as potentially important taphonomic agents that might influence our interpretations of fish remains.

Recovery

Historic period archaeological deposits in Eastern North America are commonly dry-screened through ¼-inch (6.4 mm) hardware cloth (Reitz, 1986; Martin & Richmond, 1995; Young, 1997, 1998; Underwood & Pullins, 2003; Klippel & Sichler, 2004; Hodgetts, 2006; Peacock *et al.*, 2007). Fill from the Poplar Forest pit feature was dry-screened through 6.4 mm mesh. Exception for several small samples held aside for chemical analyses, the entire dry-screened fill was subsequently processed through a Flote-Tech flotation machine (Hunter & Gassner, 1998). The heavy fraction was retained in a 1.0 mm-mesh screen. Bone from the two fractions (>6.4 [dry-screened] and 6.4 to 1.0 mm [heavy fraction]) were separated from other classes of material at Poplar Forest and transported to the University of Tennessee for identification. Bone from the heavy fraction was passed through a 6.4 mm hardware cloth again in the zooarchaeology laboratory at Tennessee to compensate for the field practice of not thoroughly picking the dry-screen because field workers knew that «missed» items would be recovered in the heavy fraction. This second screening permitted us to compare the differences in recovery between the two fractions.

Bones from small fish are notoriously under represented, if not completely missing, from ca. ≥6.4 mm dry-screened faunal assemblages (Wheeler & Jones, 1989; Payne, 1992; Gordon, 1993; Quitmyer, 2004; Wake, 2004; Gobalet, 2005; Nagaoka, 2005, Zohar & Belmaker, 2005). The fish bone assemblage from Poplar Forest is no exception; of the 186 fish bones identified to at least family, only one catfish (*Ameiurus* sp.) abdominal vertebra was present in the dry screen sample. The remaining 99.5 percent of the identified fish bones were from the heavy fraction. Two of the latter (one eel, *Anguilla rostrata*, abdominal vertebra and one mackerel, *Scomber scombrus*, caudal vertebra were, in fact, too large to pass through a 6.4 mm mesh in the laboratory at Tennessee and should have been picked from the dry screen during field recovery. Not-with-standing, had all three vertebrae been recovered in the 6.4 mm dry screen, over 98 percent of the identifiable fishbone assemblage would still have been lost had the deposits not been further processed through a 1 mm mesh screen (Figure 6). Similarly, of the 1,330 fish remains that were not identified to family, only six (<0.5 percent) were recovered from the dry screen (Figure 6b).

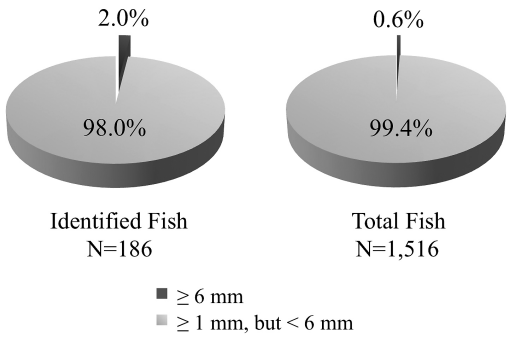

FIGURE 6

Effect of screen size on recovery of fish remains from Poplar Forest, Virginia: a, percent identified bones recovered on ≥ 6.4 mm screen compared to fraction from < 6.4 mm but ≥ 1 mm; b, percent total bones recovered on ≥ 6.4 mm screen compared to fraction from <6.4 mm but ≥ 1 mm.

Pit Fill Acidity

Low soil pH has been attributed to poor bone preservation in much of the Southeast (Wood, 1968: 173; Walsh, 1997: 196; Bedell, 2001: 91). At Poplar Forest, for example, Heath (2001: 77) notes that «because of the natural acidity of the Poplar Forest soils, bone preservation was relatively poor. Those bones that did survive represent the more durable ones (i.e. teeth or long bones) or fragments preserved in features whose soil chemistry had been altered historically by the addition of ash or other minerals that neutralized the soil».

Hydroxyapatite (calcium phosphate) makes up approximately two-thirds of most bone and is subject to solution in acid contexts. The organic one-third, on the other hand, is primarily collagen that is subject to degradation by bacteria. When either the inorganic or organic constituents are partially removed, bone is weakened. When bone is in a highly acidic environment (≤ 6.0 pH) its inorganic component is subject to high solubility (White & Hannus, 1983: 319).

Because «… soil pH is probably the major factor influencing bone survival …» (e.g. Wheeler & Jones, 1989: 63), we have assessed the pH of four of the major levels in our Poplar Forest pit feature. One-liter soil samples were collected from levels W/4, V/4, X/4 and BB/4 (Table 2) at the time of excavation during August/September of 2003 and stored in cardboard cartons at room temperature until March 2008. An IQ150 pH meter (IQ Scientific Instruments Inc., USA) with an ISFET (Ion Sensitive Field Effect Transistor silicon chip sensor) probe was used. This instrument automatically adjusts for temperature and its accuracy is ± .01%. Five grams of soil were passed through a 1.5 mm mesh screen and mixed with five grams of deionized water (1:1 slurry). The soil mixtures sat for 30 minutes to allow for room temperature equilibration (~72°F). A two-point calibration was obtained using pre-mixed buffer solutions with pH values of 7.00 and 10.01. Prior to each reading, the ISFET probe was lightly scrubbed with a toothbrush and detergent then rinsed in deionized water.

All four samples registered slightly basic (>7.0, see Table 3) which bodes well for bone preservation in general, and the preservation of other taphonomic signatures such as gnaw marks, cut marks, digestion, and root etching.

Gnawing and Digestion

Over three-fourths (76%) of the fish bones from Poplar Forest are rodent-gnawed; many to the extent that identification below class (Osteichthyes) was problematic. Had gnawing obscured the autogenous dorsal spine facets of the abdominal vertebra on Figure 7a, for example, this clupeid vertebra would have been classified as «unidentified fish».

Numerous remains of at least one Old World rat (the Norway rat, *Rattus norvegicus*), and the commensal house mouse, *Mus musculus*, were recovered from throughout the pit fill (Table 1). These commensals are likely responsible for the abundant rodent gnaw marks. To assess the nature of commensal rodent modifications to fish bone, scaled sardines (*Harengula jaguana*) with total lengths between 91 and 95 mm were fed to captive Norway rats in addition to their commercial rodent food. A single, fresh, scaled sardine was fed to five, three-month-old, females and one adult female. All of the clupeid remains, except one scale, were devoured in less than five days. Similarly, three, three-month-old, male Norway rats were fed a single scaled sardine that was devoured, save one scale, within 24 hours. In a third Norway rat feeding exercise, one roughly six month-old rat was offered a lightly boiled scaled sardine which had the flesh removed from the vertebral column. Within 24 hrs the head had been removed and the vertebral column gnawed in two near the junction of the abdominal and caudal vertebrae. Roughly half (23) of the 48 paired bones of the skull (excluding branchiostegal rays, tabulars, and radials in Rojo 1991: 231) were eaten or modified to the extent that they could not be identified. Five

Level	Munsell color and (subjective) description	pH
W/4	dark brown (7.5YR3/3) loam mixed with 50% red (2.5YR4/6) clay	7.42
V/4	dark reddish brown (2.5YR3/4) silty loam	7.26
X/4	red (10R4/6) silty clay	7.34
BB/4	dark reddish brown (5YR3/3) clay loam mottled with red (2.5YR5/6) clay	7.56

TABLE 3

Poplar Forest subfloor pit deposits: color, texture, and pH by level.

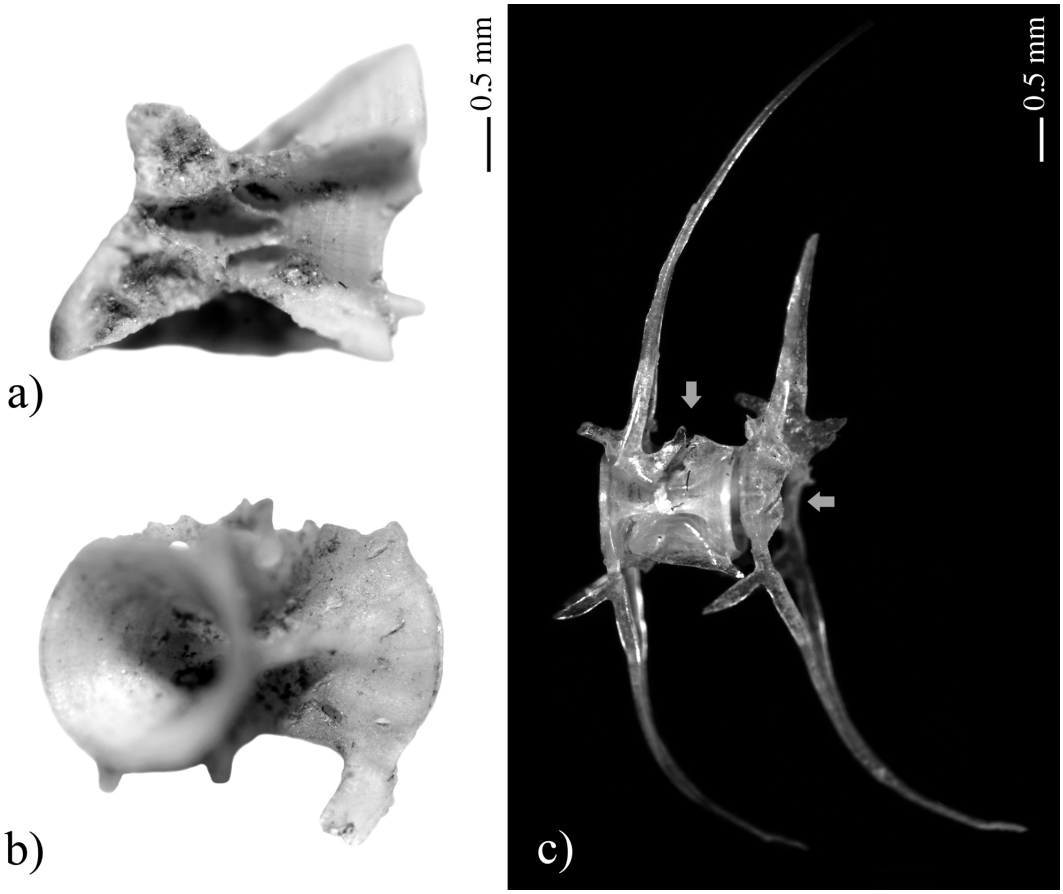

FIGURE 7

Rodent modified fish vertebrae (a, b, from historic Poplar Forest): a) dorsal view of clupeid abdominal vertebra showing autogenous spine facets and rodent gnaw marks; b) lateral view of clupeid caudal vertebra with both ventral and dorsal spines gnawed away and incisor anchor points on anterior centrum; c) modern scaled sardine (*Harengula jaguana)* vertebrae with dorsal incision on nearly complete vertebra and a portion of dorsal spine and anterior centrum gnawed away from the second vertebra by a captive Norway Rat.

caudal vertebrae were eaten, two were partially eaten (e.g. Figure 7c), and dorsal spines were gnawed from eight of the vertebrae near the abdominal/caudal junction.

In controlled laboratory settings, Wheeler & Jones (1989: 70) report that an individual herring 12 cm in length were completely ingested by individual rats within a 48 hr. feeding period. The head and backbone of 27 cm-long herring were also substantially altered; «… all bones would have been consumed» had they been left in with the rats for over 48 hours (Wheeler & Jones, 1989: 70). Their propensity for eating fish bone and the lack of recognizable fish bone in rat fecal material led Wheeler & Jones (1989: 70) to suggest that «Rats must be regarded as major destroyers of fish bones on ancient occupation sites where they are indigenous or introduced».

Rodent modification of marine fish remains at Poplar Forest (82%) was greater than that of freshwater fish (68%) bones. Klippel & Synstelien (2007) demonstrated the Norway rat is attracted to bones containing grease, while Thornton & Fee (2001) showed the same is true for the house mouse. Marine fish remains may be more extensively altered by rodent activity than freshwater fish bones because of the high fat content in mackerel and herring bones (Toppe *et al*., 2007: 397).

Evidence of gnawing on fish bone by humans and their domestic animals (e.g. dogs and cats) is rare. Wheeler & Jones (1989) note that herring vertebra may be deformed as a result of human mastication while Butler & Schroeder (1998: 966) found that vertebra from small cyprinids were deformed by human digestion processes in the near absence of mastication. Other signatures of digestion include: smoothing (rounding, thinning), pitting, and staining (Butler & Schroeder, 1998: 960).

Bones of fish eaten by humans and fed to dogs are often completely dissolved; Wheeler & Jones (1989) and Nicholson (1993) report that over 85 percent of the bones in herring were dissolved as they pass through the human digestive systems. Only roughly 25% of three cyprinids (i.e. tui chub, *Gila bicolor*) were recovered after passing through a human gut (Butler & Schroeder, 1998: 962). Butler & Schroeder (1998: 962) found that all the bones of a coho salmon (*Oncorhynchus kisutch*) were lost after passing through the digestive system of a dog. Wheeler & Jones (1989) recovered fewer than 4% of herring bones eaten by a dog. Reports on bones modified by feral and domestic cats (*Felis domesticus*) are even fewer than for humans and their dogs. Andrews & Evans (1983: 304) note that of feral cat scat from Wales «All bones are reduced to tiny edge-rounded flakes and fragments of jaw and both bones and teeth are very severely corroded, much more so than with any other predator considered here» (e.g. mongoose, genet, fox, coyote, pine martin, mustelids).

Because bones from our pit feature included several digested remains of shrews (e.g. Figure 8a), voles, and small passerine birds that were probably preyed upon by domestic cats, we fed a feral domestic cat five whole, fresh, scaled sardines (*Harengula jaguana*) that were between 9.3 cm and 10.1 cm total length and weighed between 7.8 g and 8.4 g. The female cat that weighed 2.44 Kg was given a single sardine (plus commercial

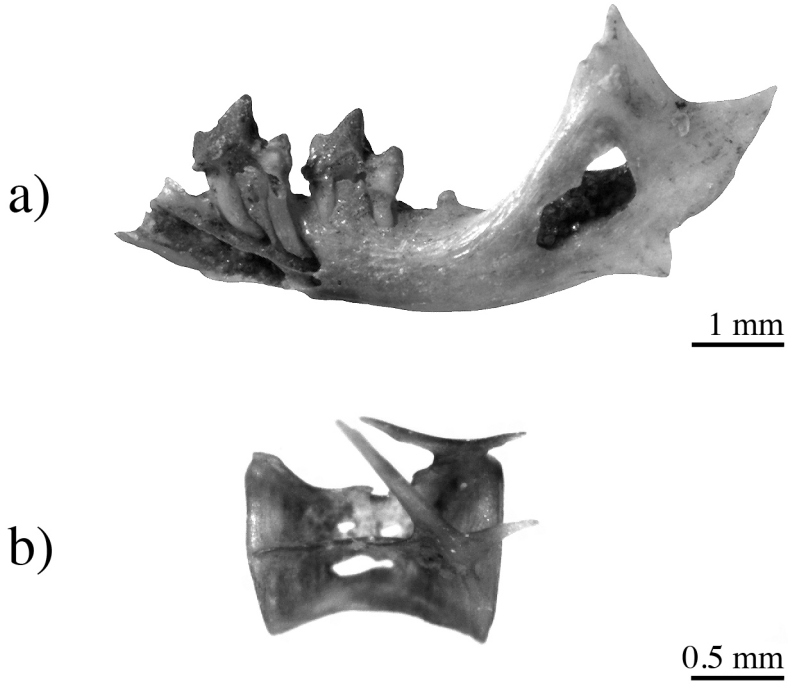

FIGURE 8

Digested fauna: a) lateral view of least shrew (*Cryptotis parva*) mandible showing heavily digested 1st and 2nd molars as well as horizontal and ascending rami; similar digestion has been seen on a common shrew (*Blarina brevicauda*) mandible from a feral domestic cat scat; b) Dorso-lateral view of heavily digested scaled sardine (*Harengula jaguana*) caudal vertebra; the ventral surface has been completely dissolved away leaving thinned margins on the remaining portions of the centrum. The anterior dorsal prezygapophyes are largely intact, but the neural arch has been eroded and holes have been dissolved in the centrum.

cat food) on 20, 25, 28 February and 3, 6 March 2008. Scat was collected daily and washed through a 1.0-mm screen. The large majority of sardine bones were completely digested. Only one preoperculum, one suboperculum, seven vertebrae and vertebrae fragments (e.g. Figure 8b), five spine, rib, and ray fragments, four scales, and seven unidentified bone fragments were recovered out of the thousands of scales and bones ingested. Fish bones from Poplar Forest are mechanically altered by gnawing rodents, but do not appear to be dissolved as are the remains of many of the shrews, voles, and passerine birds.

Butchering

Less than 1% (0.6%) of the fish bones have cut marks. One right Atlantic mackerel maxilla was cut through near its anterior end (Figure 9b). This cut would have occurred during initial processing when the fish was split through the skull and down the back prior to eviscerating and soaking. Goode & Collins (1887: 267) provide the following description of processing mackerel aboard ship:

> Except on the seiners, the mackerel, when caught, are put into barrels, and the splitting is done upon a board laid across the top of the barrel, rather than in a splitting tub. One man of each gang splits; the other two gib, or eviscerate, the fish. The tub of the man who splits, of course, contains the fish to be split. … On the side of the splitting-tray next to the «gibber» is a board about 6 to 10 inches wide, called a «splitting board» on which the splitter places the fish as he cuts them open. He takes them in his left hand (on which he has a mitten) round the center of the body; head from him, and with the splitting knife splits them down the center of the back. As fast as he splits the fish he tosses them into the tray of the «gibbers». The «gibbers» protect their hands with gloves or mittens. As fast as the «gibbers» remove remove the vissera, with a peculiar double motion of the thumb and fingers of the right hand, they through the fish into barrels that are partially filled with water; these are called «washing barrels».

FIGURE 9

Comparative and cut fish bones: a) right maxilla from modern thirteen-inch fork length mackerel showing anterior height measurement used to estimate eleven-inch fork length of mackerel represented by cut maxilla (see Table 2); b) cut right anterior *Scomber scombrus* maxilla from the historic Poplar Forest assemblage; c) dorsal view of the left pectoral spine from a Poplar Forest yellow bullhead (*Ameiurus natalis*); the heavy cut mark was undoubtedly the result of spine removal during initial processing.

> An expert can split mackerel nearly as fast in the darkest night as at any time of day. The sense of touch becomes so accurate from long practice that the fisherman can tell (without seeing it) when he grasps the mackerel whether its head is in the right direction or not, and also which side should be laid on the board in order to bring the fish back in proper position for the knife.
>
> The splitter holds the knife with his fingers, letting the thumb slide down along the upper side of the fish, thus guiding unerringly the keen and swift moving blade. Whether the fish be large or small it is almost invariably split with the utmost precision, the edge of the knife glancing along on the left side of the vertebra, with scarcely a hair's breath from it, while the point goes just deep enough and no father (Goode & Collins 1887: 267).

Prior to the capture of large quantities of mackerel with the regular use of purse-seines in the 1870's, mackerel were frequently «messed» to improve their value:

> During the fifties, sixties, and seventies, when our American fishing vessels went to Chaleur Bay «jiggin mack'rel» and their crews fished on shares, every man had his own private mark on each barrel of his fish. Some of the more industrious men «messed» their salt mackerel, when they had the opportunity, for it sold for as much as ten dollars a barrel extra. «Messed mackerel» were treated as follows: first the heads were cut off, then all the settled blood around the napes, throat, and backbone was scraped off with a mackerel knife, and the fish washed very clean and white. Many men in fathers boyhood days «messed» part of their mackerel when «hooking in the Bay.» And his crew often «messed» their mackerel when they had the chance, while he was skipper in the schooner *Archer* (Pierce, 1934: 28, 29).

Had the mackerel from Poplar Forest been «messed», skull parts like the cut maxilla described above would be missing from the assemblage.

The left pectoral spine of a yellow bullhead (*Ameiurus natalis*) is cut on the dorsal surface near it's articulation with the cleithrum (Figure 9c). The cut probably occurred during initial processing to remove the sharp spine. One bullhead (*Ameiurus* sp.) pterygiophore, that attaches to the first, short, dorsal spine, was cut through at its dorsal end; again probably during initial processing to remove the sharp spine attached to the second dorsal pterygiophore. A single minnow (Cyprinidae) cleithrum was cut along its ventral margin and three spines or ribs from unidentified fish are cut in two.

Heat Alteration and Root Etching

Fish remains from Poplar Forest show only minimal evidence of heat alteration and root etching. Less than 0.3% are heat altered. One herring vertebra is charred (blackened) while a second is calcined (grayish-white); two unidentified fish vertebrae were also calcined. The three calcined vertebrae were subject to temperatures in excess of 500 degrees centigrade, indicating they were directly in a fire at one point in their taphonomic histories (McCutcheon, 1992; Bennett, 1999). The blackened vertebra was likely heat altered near, but not directly in a fire. Both charred and calcined bone are usually weakened (Nicholson, 1993: 418), if not fragmented beyond recognition, as a result of heat alteration.

Root etching only occurs on one unidentified flat bone fragment that appears to be one of the opercular series from an unknown fish species. Shallow, sinuous, lines with U-shaped cross sections are etched on bone by acids associated with plant roots. Fisher (1995: 43) notes that it isn't known whether acids are emitted by the roots themselves or by fungi associated with root decomposition. Regardless of the mechanism, little evidence of root etching occurs in the Poplar Forest assemblage.

DISCUSSION

Antebellum foodways among enslaved African Americans in the antebellum southern United States varied depending on a variety of circumstances including: season, plantation position on the landscape, plantation size, the crops being raised, and how slaves were organized. Conventional wisdom, however, suggests that pork provided the bulk of the protein for slaves in the Southeast (e.g. Hilliard, 1972; Samford, 1996; Covey & Eisnach, 2009). While pork was undeniably important, there are archaeological assemblages that indicate plantation owners on estuaries and bays of the Atlantic Ocean provisioned their slaves with copious quantities of fish (Bowen,

1996: 112). Similarly, historic records indicate that some plantations on, or near, navigable waterways provisioned their slaves with significant quantities of fish. Thomas Jefferson, for example, noted that during the late 1700's and early 1800's salt pork was twice as expensive as salt fish; «a barrel of fish [200 lbs.] costing 7. D. goes as far with laborers as 200. lb. of pork worth 14. D.» (Betts, 1953: 77). Jefferson's account book and letters indicate that he purchased fish for both of his plantations (i.e. Monticello and Poplar Forest). An entry from June 7, 1799 notes that «… Wm. Johnson has brought up for me 17. barrels of fish wt. 3927. lb @ 3/pr. C.» (Betts, 1953: 187). On July 9, 1810 Jefferson wrote to Joseph Darmsdatt:

> I received last night yours of the 6th the price for the fish is indeed very high; and discouraging; but the necessity of it is still stronger.
>
> I will therefore desire you to send me a dozen barrels, one half to Milton [Monticello], the other to Lynchburg [Poplar Forest] according to my former letter. (Betts, 1953: 188).

Betts (1953: 187) suggests that Jefferson's provisioning with salt fish may have occurred primarily during the winter months when slaves were unable to catch their own freshwater fish from local streams.

The post-Jefferson fauna described here is from an enslaved African American context at Poplar Forest that dates approximately one-half-century after Jefferson comments on fish for his plantations. The same position on the landscape (i.e. Poplar Forest, VA. roughly 217 Km [135 river mi.]) up the James River from Richmond and approximately 19 Km (12 mi.) inland from Lynchburg) could lead to the speculation that preserved fish might also be present during the Hutter occupation. A review of Hutter's expenses (Cobbs, 1861) between July 1856 and December 1861 shows that he purchased oysters, chickens, ducks, rabbits, sheep, hogs, pork, mackerel, and shad whose remains could show up in the archaeological record. Neither the shad nor the mackerel, however, were in the quantities described by Jefferson a few decades earlier (Betts, 1953: 188). On 21 April 1858, two shad were purchased for 50c and on 29 March 1861, 50c was paid for an unspecified quantity of shad. On 21 April 1858, one «kit» of mackerel was purchased for $2.50; a kit was much less than a barrel and could have weighed as little as twenty pounds (Ward, 1882: 103). On 3 February 1858, 25c was paid for freight on an unspecified amount of «mackrel». Such small quantities of preserved fish over a five to six-year period seems likely to have been for the Hutters' personal use rather than a substantive portion of protein provisions for plantation slaves.

Recovery as a component of taphonomy is important to the interpretation of our fish fauna. Animal bones in the 6.4 mm fraction from the pit feature are in general agreement with the Hutter Income and Expense Journal (Cobbs, 1861) in that there is little evidence of fish in the enslaved African American diet; only one freshwater catfish vertebra was recovered. Remains from the same feature fill that passed through the 6.4 mm screen, but were retained by the 1 mm mesh, include 185 (>99%) bones identifiable to ten genera of five families (Table 1). By way of comparison with the 120 pig bones and teeth from the pit (included with domestic mammals in Table 1), less than 13% (N=15) were lost by the 6.4 mm mesh, which demonstrates the importance of recovery methods to interpretations of animal bone assemblages. Such a common practice contributes to the general elevation in importance of pork in the southern antebellum slave diet.

Freshwater minnows, bullheads, and madtoms, that were likely obtained from the small streams around the plantation by enslaved African Americans, make up the greatest diversity while marine mackerel and herring remains are nearly twice as numerous and likely represent provisions provided by the Hutters (Table 1). If Hutter followed Jefferson's practice of provisioning with salt fish primarily during the winter months when freshwater fish were less available, the Hutter Period assemblage may suggest an accumulation of pit fill during both warm and cold seasons.

The second taphonomic agent that altered the nature of our assemblage was the commensal rodent. Actualistic studies described above, as well as those reported by Wheeler & Jones (1989), suggest that fish remains reported here have probably been significantly reduced in number by rats and mice. Other potentially significant taphonomic agents that don't appear to have negatively altered the assemblage include: deposit pH, human or carnivore gnawing and digestion, butchering, burning, and root etching.

CONCLUSIONS

The faunal assemblage from an enslaved African American subfloor pit at Poplar Forest, VA has been influenced by several taphonomic factors. A deposit pH of over 7.0 has positively affected the preservation of even relatively delicate fish bones. The excellent preservation not only permitted observations on butchering practices common to the preparation of preserved fish such as Atlantic mackerel, it also permitted observations on salient rodent modifications to the fish bone assemblage. The heavily rodent modified assemblage, along with observations on rat alterations to modern clupeid remains, strongly suggests that fish bones were significantly more numerous at the time of their deposition.

Recovery methods employed at the time of excavation are without doubt as important to the nature of the fish bone assemblage as deposit pH and destruction by rodents. Because we were able to compare remains retained in the commonly employed 6.4 mm screen with remains that had passed through it but were subsequently retained in a 1 mm mesh, it was possible to assess the importance of the latter for our assemblage. Of the identifiable remains, only one freshwater bullhead vertebra was retained in the 6.4 mm mesh; 185 identifiable bones were retained in the 1 mm mesh, including all of the marine fish that represent preserved fish that were probably supplied to the slaves as provisions. The Atlantic mackerel vertebrae are in accord with small No. 3 mackerel that were routinely purchased for slave rations; vertebrae of the larger No. 1 mackerel would have been retained in the 6.4 mm screen. Bones of the small freshwater minnows, madtoms, and bullheads likely represent fish caught by the slaves with traps or nets in local streams.

A consideration of the taphonomic attributes of the fish fauna from Poplar Forest has allowed us to argue that the slaves there were provided with preserved fish from the Atlantic Ocean and permitted to obtain their own freshwater fish from local streams. This, then, suggests that Poplar Forest enslaved African Americans display characteristics of gangs who were generally provisioned as well as task groups who were permitted, if not expected, to generate at least a portion of their own food.

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