

Queen Anne's Revenge
Shipwreck Project



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**Wood Species Analysis of Ship Timbers and Wooden Items
Recovered from Shipwreck 31CR314, *Queen Anne's Revenge*
Site**

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Introduction

This report describes a series of wood anatomical analyses and species identifications of ship timbers, wooden artifacts, and other wooden objects recovered in conjunction with excavations of the shipwreck 31CR314, located in Beaufort Inlet, North Carolina. The State of North Carolina's Underwater Archaeology Branch --*Queen Anne's Revenge* Project-- under the direction of M. Wilde-Ramsing, is currently investigating the site. Temporal assignments for the wreckage based on location, historic documents, artifacts, and other evidence indicate the ship dates to the early eighteenth century. Moreover, the wreckage appears to be that of a large, heavily armed ship, and may be the remains of a French vessel originally known as the *Concorde*, that was ultimately captured and renamed the *Queen Anne's Revenge* by the British pirate Edward Thatch (aka Blackbeard)(Lawrence and Wilde-Ramsing 2001; Lusardi 2000; Moore 1997).

We are involved with the project as specialists in wood species analysis, anatomical variation, and the study of ancient timbers. The research began in 1997-1998 by identifying some of the first timbers, sheathing, and wooden items retrieved from the site, including the wood of an anchor stock. We analyzed additional timbers and wooden items in the succeeding years, including most recently (2004) a set of wooden objects from separate excavation seasons at the site. All together, analyzed samples belong to three basic categories of material: 1) ship structural remains, including various timbers, frames, and other wooden components of the ship; 2) assorted wooden artifacts recovered in and around the ship's wreckage, and; 3) miscellaneous wooden items from the wreck site, some of which are now understood to be intrusive items that found their way onto the wreck site by normal wave and current action, or by other means, e.g., in concert with periodic disturbances by hurricanes or inlet channel currents.

Materials and Methods of Analysis

The specimens we have analyzed primarily consist of samples of timbers and other construction materials that were extracted from the original pieces by the project conservators and forwarded to us for detailed study in our laboratories; wooden artifacts and other smaller objects were sent to us whole with no prior sampling. In June 2000 we traveled directly to the conservation laboratory (then in Morehead City) to conduct on-site inspection and analyses of large complete timbers, along with the project dendrochronologist, Michael Baillie.

All wood identifications were conducted according to standard practice, generally at magnifications ranging from 40x-1200x. A series of published anatomical keys (Fahn et. al. 1986; Outer et al. 1988; Panshin and de Zeeuw 1980), computerized databases, and modern wood comparative specimens were used to determine the wood identifications. During our on-site visit, several of the ship timbers were identified by direct visual inspection focusing on gross anatomical

characters, e.g. of the oak genus and its particular anatomical groups, that we were able to observe with a 10x hand lens. At that time, we also sampled select timbers, especially conifer woods, to conduct more intensive follow-up study later in the laboratory.

All together we have analyzed a total of 74 wood samples from the Beaufort Inlet shipwreck. This sample assemblage includes 18 timbers, including three treenails still embedded in their planks, which we examined directly during our conservation laboratory site visit. Ultimately, we classified each timber or specimen to the lowest possible taxonomic unit. Generally, where wood anatomy is concerned, the taxonomic specificity or level of resolution is to genus (e.g. pine, *Pinus* sp.) or subgenus or section (e.g. *Pinus* sp., section *Haploxyylon*, the soft pines, versus section *Diploxyylon*, the hard pines), but occasionally taxa may be identified to finer taxonomic ranks, including in a few cases, to species. In general, the extent to which any particular wood identification may be pursued depends 1) on inherent limitations to wood taxonomy and identification, particularly as concerns particular taxonomic groups, and 2) the state of preservation of the cell structure characterizing individual samples, including any unique conditions that may obscure the anatomy, e.g. impregnation of the woody tissues by iron and salts resulting from the break down of metals, or the penetration and channeling by marine worms and the similar effects of other biotic agents.

Prior to this report, a number of samples and identifications were communicated in various earlier short reports and informal communications to the project director (beginning in August 1997). All of these previous identifications are incorporated in this comprehensive report, along with samples more recently analyzed and identified by us.

Sample Assemblage and Species Assignments

Wood samples from 31CR314 belong to three basic sets or classes of material: 1) ship structural remains; 2) wooden artifacts; 3) miscellaneous non-specific wooden objects. We detail the analyses of each such group in this section. All together, at least 12 wood taxa were identified from the wreck site, including seven types of softwood (coniferous woods, e.g. pines) and as many as five hardwoods (angiosperms). The latter comprise four genera native to temperate regions and at least one to the American tropics.

Ship timbers and related structural elements

A total of 35 timbers and associated construction materials have been analyzed in our effort to assign wood identifications and assist Wilde-Ramsing in the interpretation of the various elements of the hull structure (Table 1, part 1 “timbers and other ship-structural components”). All together, these identifications demonstrate a narrow range of wood taxa, encompassing only two genera and therefore indicative of a tightly focused use of woods that were preferred or otherwise played an

important role in ship construction. Oak (*Quercus* sp.) served as the primary construction material, comprising >85% (n = 30, Table 1) of the sample assemblage described as ship's timber or other structural remains. In particular, oak exhibiting a white-oak type (Panshin and de Zeeuw 1980) of anatomical structure seems to have been the predominant type of wood that was used to construct the Beaufort Inlet vessel. Twenty-eight of the timber samples were identified to this particular anatomical group, including 13 frames, 6 planks (Figure 1), 7 treenails, 1 shim, and an unidentified timber specimen (QAR245.002.01). Another sample (QAR245.002.02) represents an oak that exhibits a nearly diffuse-porous, dendritic vessel arrangement, and on that basis was assigned to the live oak anatomical group. Finally, an additional bottom plank specimen (QAR368.000) was identified to the oak genus but could not be assigned to any particular anatomical group due to deficiencies in anatomical preservation.



Figure 1 Plank QAR437.000 (cross section, macroscopic perspective), *Quercus* sp., oak. This sample was also included in the dendrochronological analyses conducted by Dr. Michael Baillie (Queens College, Belfast, Northern Ireland).

A point of clarification about oaks needs mention: their classification into sub-generic anatomical groups, such as we have indicated above, is based on three relatively distinct patterns of vessel distribution and arrangement as viewed primarily in transverse perspective. This system of three anatomical groups—specifically, the red, white, and live oak groups-- is essentially one that was established to classify oaks native to North America. For example, those species classified as having a

white type of anatomical structure, just as indicated above, more or less conform to that of the American white oak (*Quercus alba*). Similarly, the “red oaks” encompass American red oak (*Q. rubra*) and several other species with similar anatomy. Other species that generally occur in subtropical or equivalent climates exhibit vessel patterning consistent with live oak (*Q. virginiana*), and they generally lack the intra-annual variation in vessel arrangement, diameters, and distribution that characterize the wood of oaks from temperate regions. In broader perspective, we have observed that various oak species feature growth rings and cellular arrangements that approximately correspond to the three American anatomical groupings, allowing to some extent for direct comparison and a somewhat similar classification system. In general however, considering both the genus level and the sub-generic groups, all oak taxa are similar enough that wood samples from an “unidentified” shipwreck or other source for which origin is unknown or largely uncertain, may not be classified to any particular oak species based solely on wood anatomy, much less ascribed to a particular geographic region (e.g., see discussion in Dean 1985). Therefore, while the predominant type of oak, and for that matter, of ship-construction material, found on the Beaufort Inlet shipwreck may be classified to the “white anatomical group” according to the American oak classification system, this is not to suggest that the wood is in fact necessarily an American species. It is entirely possible, if not more likely, given the potential identification of the ship noted earlier, that the source of the oak timbers was external, i.e. Europe. Furthermore, drawing on our respective experiences comparing oak wood from both sides of the Atlantic, our impression is that the wreck samples in fact conform closely to particular European species exhibiting approximately similar (to American white oak) cellular structure, e.g. *Q. robur* and/or *Q. petraea*. Nevertheless, this assessment is impressionistic, not a definitive assignment to any species or region. The same basic caveat applies to the (QAR245.002.02) sample mentioned above: the anatomical structure is consistent with North American “live oaks,” e.g. live oak (*Q. virginiana*), and that of other species from similar habitats, including certain southern European and Mediterranean species, e.g. *Q. cerris*.

Pine (five samples) was also identified among the samples of ship-structural elements, in this case all filling the same basic role, the individual timbers variously identified as sheathing, sheathing plank, or sacrificial plank (Table 1). The specific type of pine is one that belongs to the “sylvestris” or “red” anatomical group (E.W.J. Phillips 1941:293-294), which includes species that are native to North America (e.g. *P. resinosa*, red pine), and others (e.g., *P. sylvestris*, the “Norway” or “Scots” pine) native to the Old World. Close scrutiny of particular cellular characteristics indicates that the species found on the Beaufort Inlet wreck is in fact *Pinus sylvestris*, the Scots pine (Figure 2). This is based on recent unpublished research by wood anatomists, including Miller, in which diagnostic anatomical details, particularly a series of heights or length measurements based on the fusiform rays in tangential perspective (Richter et al. 2004), of individual members of the *sylvestris* anatomical group were

quantified, compared, and statistically analyzed to assess taxonomic significance. In its native range, Scots pine has a relatively widespread geographic distribution including Spain, France, Scotland, Northern Europe and Scandinavia, Yugoslavia, Romania, Turkey, and Russia [U.S.D.A. 1965].

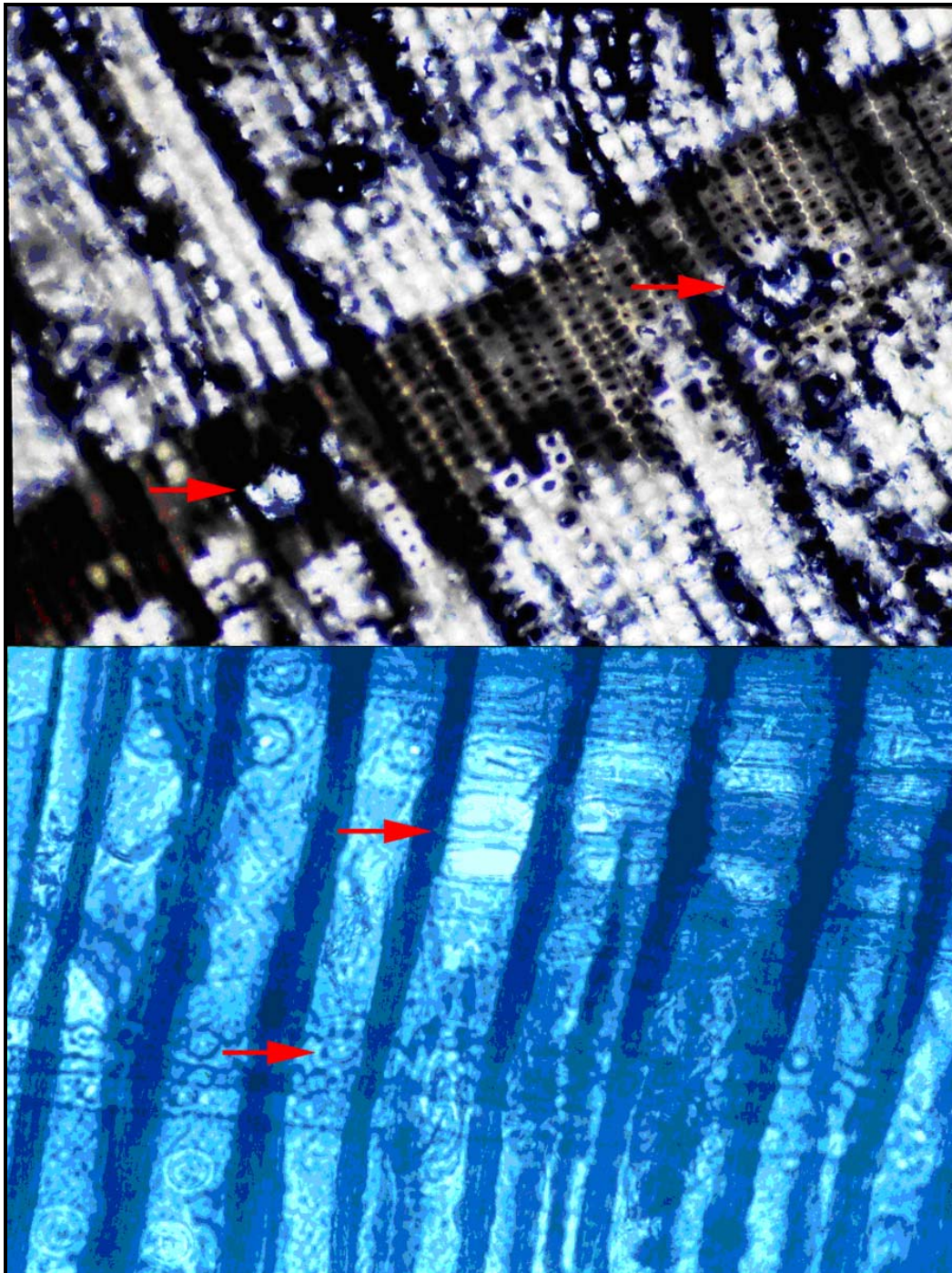


Figure 2 [Top] Sheathing plank QAR438.000 (cross section, 40x), showing growth-ring boundary and two axial resin canals (red arrows), *Pinus sylvestris*; [Bottom] Sheathing plank QAR439.000 (radial section, 400x), showing fenestriform pitting and dentate ray tracheids (red arrows), *Pinus sylvestris*

Artifact	Item	Identification
0 (1997)	Floor frame	<i>Quercus</i> sp., oak, white-type anatomy
QAR245.002.01	Timber A (sample 25-A)	<i>Quercus</i> sp., oak, white-type anatomy
QAR245.002.02	Timber B (sample 25-B)	<i>Quercus</i> sp., oak, live-oak type anatomy
QAR255.001	Sheathing (sample 56)	<i>Pinus</i> sp., <i>sylvestris</i> anatomical group
QAR298.000	Treenail 90N/92E	<i>Quercus</i> sp., oak, white-type anatomy
QAR367.000	Sacrificial plank no. 7	<i>Pinus</i> sp., <i>sylvestris</i> anatomical group
QAR368.000	Bottom plank no. 5	<i>Quercus</i> sp., oak, anatomical group indeterminate
QAR369.000	Shim no. 10	<i>Quercus</i> sp., oak, white-type anatomy
QAR370.000	Treenail no. 7	<i>Quercus</i> sp., oak, white-type, narrow growth rings
QAR371.000	Frame no. 9	<i>Quercus</i> sp., oak, white-type anatomy
QAR374.000	Plank no. 3	<i>Quercus</i> sp., oak, white-type anatomy
QAR380.000	Treenail near anchor	<i>Quercus</i> sp., oak, white-type anatomy
QAR383.000	Treenail no. 5	<i>Quercus</i> sp., oak, white-type anatomy
QAR384.000	Frame no. 8	<i>Quercus</i> sp., oak, white-type anatomy
QAR419.000	Plank	<i>Quercus</i> sp., oak, white-type; plank with treenails and iron spike holes, sheathing holes on outside
QAR424.000	Frame	<i>Quercus</i> sp., oak, white-type; bottom is radial surface, 3-4 rows of early wood, 5-8mm wide
QAR425.000	Frame	<i>Quercus</i> sp., oak, white-type; central pith present (end view) and tangential surface is exposed on flat face (e.g., plane sawn timber); radius 13 cm, wide growth rings
QAR426.000	Frame	<i>Quercus</i> sp., oak, white-type; associated with shim above (sample 369.000); 2-3 mm rings
QAR427.000	Frame	<i>Quercus</i> sp., oak, white-type; very wide rings
QAR428.000	Frame	<i>Quercus</i> sp., oak, white-type; 60+/- rings, 2-3 mm, possible sapwood/hardwood boundary present
QAR429.000	Frame	<i>Quercus</i> sp., oak, white-type; 100+/- rings, 1-2 mm, (relatively narrow); knots on one side
QAR430.000	Frame	<i>Quercus</i> sp., oak, white-type; 40+/- rings, moderately wide rings; possible sapwood/ heartwood interface
QAR431.000	Frame	<i>Quercus</i> sp., oak, white-type; massive (3-5 mm) multi-seriate rays (tangential view); minimal late-wood increments
QAR432.000	Frame	<i>Quercus</i> sp., oak, white-type; 5-6 mm rings, radial orientation (quarter-sawn), possible sapwood
QAR433.000	Frame	<i>Quercus</i> sp., oak, white-type; plane-sawn timber; early wood with 3-5 vessels; branch traces (knots)
QAR434.000	Plank	<i>Quercus</i> sp., oak, white-type; still-embedded treenails are same wood type (dendrochronology sample removed [see Baillie report])
QAR435.000	Plank	<i>Quercus</i> sp., oak, white-type; still-embedded treenails are same wood type (dendrochronology sample removed [see Baillie report])
QAR436.000	Plank	<i>Quercus</i> sp., oak, white-type; still-embedded treenails are same wood type
QAR437.000	Plank	<i>Quercus</i> sp., oak, white-type; end rings, bottom filler piece (dendrochronology sample removed [see Baillie report])
QAR438.000	Sheathing Plank	<i>Pinus sylvestris</i> , Scots pine
QAR439.000	Sheathing Plank	<i>Pinus sylvestris</i> , Scots pine
QAR440.000	Sheathing Plank	<i>Pinus sylvestris</i> , Scots pine

Table 1 Wood Identifications of Timbers and Other Ship-Structural Components

Wooden artifacts

Thirteen artifacts or otherwise small objects showing definite signs of cultural modification, e.g. tool marks, were analyzed, resulting in the identification of a minimum of six taxa (Table 2). Portions of two wooden stocks still attached to their original iron anchors were recovered from two locations. The first was found at the north end of the site and appears to be the ship's bower anchor; the second was discovered ca. 400 feet to the south and may have served as a kedge anchor used in an attempt to free the grounded vessel. The south anchor stock (QAR256.000) was identified as white-type oak, the same as described above for the ship-structural components. In contrast, the north anchor stock (QAR386.000) is a tropical hardwood, *Bucida* sp. (Combretaceae, especially *B. buceras*, black olive or oxhorn bucida), a genus native to the Caribbean region.

Artifact	Item	Identification
QAR256.000	south anchor stock	<i>Quercus</i> sp., oak, white-type anatomy
QAR350.004	fuse fragment	<i>Fagus</i> sp., beech
QAR386.000	north anchor stock	<i>Bucida</i> sp., especially <i>B. buceras</i> , black olive or oxhorn bucida (native of Caribbean region)
QAR418.002	Tompion C-19	<i>Pinus</i> sp., <i>sula</i> group, e.g. <i>P. canariensis</i> , Canary Island pine, and <i>P. halepensis</i> , Aleppo pine (Old World taxa), or <i>ponderosa</i> group, including <i>P. pinaster</i> , maritime pine (Old World), and several western North American species
QAR418.013	Tompion C-21	cf. <i>Abies</i> sp., fir
QAR418.156	wood chip	<i>Quercus</i> sp., oak, anatomical group undetermined
QAR441.001	2 wood specimens	(1) worked-linear wood (in two fragments) = <i>Pinus</i> sp., <i>ponderosa</i> , <i>sula</i> , or <i>taeda</i> groups; (2) chip with nail holes = <i>Quercus</i> sp., oak, cf. white group
QAR449.004	wood chip	<i>Pinus</i> sp., <i>sylvestris</i> group, e.g. <i>P. resinosa</i> , red pine (North America), or <i>P. sylvestris</i> , Scots pine (Europe)
QAR467.000	marlinspike	<i>Pinus</i> sp., <i>sylvestris</i> group, e.g. <i>P. resinosa</i> , red pine (North America), or <i>P. sylvestris</i> , Scots pine (Europe)
QAR469.010	2 wood specimens	(1) large block = <i>Pinus sylvestris</i> , Scots pine; (2) chip with adzed/beveled end = <i>Pinus</i> sp., <i>ponderosa</i> , <i>sula</i> , or <i>taeda</i> anatomical groups
QAR479.004	stave end	<i>Quercus</i> sp., white-type oak

Table 2 Wood Identifications of Wood Artifacts

Two tompions from a pair of cannons also proved to be two different wood taxa (Table 2). Tompion C-21 (QAR418.013) is provisionally identified as fir (cf. *Abies* sp., a genus found in both hemispheres), and tompion C-19 (QAR418.002) is pine. Regarding the latter, the particular form of the ray tracheids combined with the type of cross-field pitting indicate the pine belongs to either of a pair of anatomical groups: the *sula* pines, e.g. *P. canariensis* (Canary Island pine) and *P. halepensis* (Aleppo pine) (primarily if not all Old World species), or the *ponderosa* group, including *P. pinaster* (maritime pine [Old World]), and several western North American species (E.W.J. Phillips 1941). In

all probability, this particular wood, like the Scots pine of the *sylvestris* group, represents a European pine.

A fuse fragment from an iron hand grenade was identified as beech, *Fagus* sp. This generally temperate hardwood genus includes species found on both sides of the Atlantic, including six in Europe and eastern Asia, one in eastern North America, and another in Mexico (Record and Hess 1943:166; Tubbs and Houston 1990). The woods of the different species are inseparable by wood anatomy alone.

A marlinspike (QAR467.000) was identified to the *sylvestris* anatomical group of pines, possibly the Scots pine, or an American species such as the red pine (*P. resinosa*), as indicated earlier. An adzed wood chip (QAR449.004) belongs to the same group of pines. A large block of wood (QAR469.010) was identified more precisely as the Scots pine, the species *P. sylvestris*, based on the ray characteristics indicated above.

A worked linear specimen of wood (QAR441.001) and an adzed chip with a beveled end (QAR469.010) both were also identified to the pine genus, specifically to the section *Diploxylon* (the hard or “dentate” pines), but preservation deficiencies precluded a definitive assignment to any single pine group. The section *Diploxylon* includes all of the groups and pine species that have been mentioned thus far in this report.

An end fragment from a barrel stave (QAR479.004) was identified as oak belonging to the white anatomical group. Finally, two additional wood chips (QAR418.156 and QAR441.001) were identified as oak, a little less certainly but probably in both cases also the white oak anatomical group.

Miscellaneous wooden items

A total of 26 additional objects that are less certain as to their actual association with the shipwreck were analyzed to assess wood type. Five different softwoods (coniferous species) were identified among this assemblage of wooden items (Table 3): including as follows:

- A pair of roundwood, i.e. cylindrical, objects (QAR040.000 and QAR266.000): the cedar family, Cupressaceae, potentially any of three possible candidate genera: *Chamaecyparis* spp. (white cedars), *Cupressus* spp. (Old World cypress), *Thuja* spp. (arbor-vitae, etc.).
- Two plank-like wood specimens (QAR104.000 and QAR190.000): *Pinus* sp., *taeda* anatomical group of pines, which is primarily or exclusively confined geographically to southeastern North America.
- Unidentified wood sample (QAR331.000): pine belonging to the *sylvestris* anatomical group (members found in both hemispheres).
- An item originally identified (evidently mistakenly) as “frame number 2” (QAR373.000): *Juniperus* sp., red cedar (eastern North America, Caribbean, and Bermuda).
- A specimen designated “wood near C4” (QAR361.000): *Taxodium* sp., cypress (e.g., bald cypress, *T. distichum*, southeastern North America).

Artifact	Item	Identification
QAR023.000	slat "sand fence"	<i>Populus</i> spp., cottonwood/poplar, aspen
QAR038.000	slat "sand fence"	<i>Populus</i> spp., cottonwoods/poplar, aspen
QAR040.000	roundwood	<i>Cupressaceae</i> , cedar family, possibilities include <i>Chamaecyparis</i> spp. (white cedars), <i>Cupressus</i> spp. (Old World cypress), or <i>Thuja</i> spp. (arbor-vitae)
QAR104.000	plank-like wood	<i>Pinus</i> sp., <i>taeda</i> group, southern hard/yellow pines
QAR190.000	plank-like wood	<i>Pinus</i> sp., <i>taeda</i> group, southern hard/yellow pines
QAR258.000	wood (3) 90N/80-90E	(1) <i>Pinus</i> sp., <i>taeda</i> group, southern hard pines (laminated plywood); (2) <i>Pinus</i> sp., <i>taeda</i> group as above (non-laminated); (3) unidentified hardwood
QAR266.000	roundwood	<i>Cupressaceae</i> , cedar family, possibilities include <i>Chamaecyparis</i> spp. (white cedars), <i>Cupressus</i> spp. (Old World cypress), or <i>Thuja</i> spp. (arbor-vitae)
QAR331.000	wood samples	<i>Pinus</i> sp., <i>sylvestris</i> anatomical group
QAR341.003	plank-like wood	cf. <i>Quercus</i> sp., oak (2 similar specimens, both with heavy iron impregnation)
QAR341.005	split roundwood	cf. <i>Quercus</i> sp., oak
QAR341.007	plank-like wood	<i>Quercus</i> sp., oak, white-type anatomy
QAR341.009	wood fragments	unidentified hardwood, cf. <i>Quercus</i> sp.
QAR341.012	linear strip with iron	hardwood, cf. <i>Quercus</i> sp., oak, or <i>Fagus</i> sp., beech
QAR358.000	Wood under C16	<i>Quercus</i> sp., oak, anatomical group indeterminate
QAR361.000	Wood near C4	<i>Taxodium</i> sp., cypress
QAR366.095	forked roundwood	<i>Combretaceae</i> , cf. <i>Bucida</i> sp., <i>Conocarpus</i> sp. or <i>Terminalia</i> sp.
QAR373.000	Wood unknown	<i>Juniperus</i> sp., red cedar
QAR372.000	slat "sand fence"	<i>Populus</i> sp., cottonwood/poplar, aspen
QAR379.000	Wood near anchor	<i>Quercus</i> sp., oak, white-type anatomy
QAR418.149	slats (4) "sand fence"	<i>Populus</i> spp., cottonwoods/poplar, aspen
QAR418.155	wood with iron	<i>Quercus</i> sp., oak, white-type anatomy

Table 3 Wood Identifications of Miscellaneous Wood Items

At least two hardwoods also were identified among the miscellaneous wood specimens recovered from the site, particularly oak of the white type, and a tropical wood, probably the same as the anchor stock mentioned above. These are as follows:

- Three plank-like wood specimens (QAR341.003 and QAR341.007): *Quercus* sp., the latter-numbered specimen is assigned to the white oak anatomical group.
- Wood found near an anchor (QAR379.000) and another (QAR418.155) with iron impregnation (probably indicating close association with metal fasteners): white oak anatomical group.
- Three unclassified specimens of oak or probable oak (QAR341.005, QAR341.009, QAR358.000).
- A linear strip of wood (QAR341.012): a hardwood, either oak or beech.
- A roundwood specimen with forked end (QAR366.095): *Combretaceae*, cf. *Bucida* sp. or closely related genus (a tropical wood; Table 1).

Also among the miscellaneous wood remains from the site are several specimens that are clearly modern and intrusive into the shipwreck deposits. These include fragment(s) of plywood (*Pinus* sp., *taeda* anatomical group, southern hard pines; see QAR258.000) and seven broken slats of sand

fencing (QAR023.000, QAR038.000, QAR372.000, QAR418.149 [4 pieces]), all identified as *Populus* sp., cottonwoods and aspens (probably a North American species) (Table 3).

Discussion

Several distinct wood types were identified in the sample assemblage recovered from shipwreck 31CR314 found lying in Beaufort Inlet. Focusing strictly on items and woods that are definitively associated with the wreck, i.e. the construction members and various wooden artifacts, then at least seven taxa characterize the ship samples. White-type oak dominates the assemblage in general and served as an important timber resource. This type of oak comprises most of the ship construction elements that have been identified, including all of the frames, several planks, a shim, and all of the treenails. It was the wood used for at least two of the wooden artifacts: an anchor stock and a barrel stave. Moreover, the white-type oak was identified as the wood of at least three of the miscellaneous items, including plank-like specimens and wood recovered in the vicinity of an anchor. These and several others of the samples are highly likely also to be securely associated with the wreckage given the dominance of the wood among the definitive wreck remains, and the relatively minor presence of white-type oaks in the coastal Carolinas region. In other words, it is less likely that oak specimens assigned to the white anatomical group among the miscellaneous unclassified items are modern and/or intrusive given the biogeography of native species (Barbour and Christensen 1993), and the strong association of the wood with the undoubted cultural components of the wreck. All together, the total is 35 assignments to the white-type oak.

White oak as a timber resource has a long history and very common usage in ship construction, especially in the British Isles and other western European nations with strong naval traditions and shipbuilding industries (Dodds and Moore 1984). The wood became an integral part of local ship construction and design, a tradition which while developed originally in Europe based on the familiar species there, was ultimately transferred and practiced in North America where the native white oak was quickly recognized and utilized as equally superior timber. In our combined experience, we have identified white-oak type wood from a variety of European and American shipwrecks spanning the sixteenth to nineteenth centuries (Miller and Newsom, laboratory data); we suspect that in the case of the wreck found in Beaufort Inlet, the timber represents a European species.

Second in prominence among the wood taxa identified from the Beaufort Inlet wreck is the pine genus, particularly the *syvestris* anatomical group and especially Scots pine, *Pinus sylvestris*. It is highly likely that all of the *syvestris*-group material from the wreck site is Scots pine, thus all of it originated in Europe, including though not absolutely the Mediterranean region, much as we infer for the predominant oak wood from the wreck, as indicated earlier. Drawing again from past experience, we have identified the *syvestris* or “red” pine taxon among the structural elements sampled from a

number of wrecks dating as early as the sixteenth and seventeenth centuries. Regarding ships of Spanish origin this includes strakes, keel, sacrificial sheathing, and ceiling planks (Miller and Newsom, laboratory data). The construction of an eighteenth-century British ship (wreck found at Chubbs Head Cut, Bermuda) entailed use of Scots pine for sheathing and sacrificial planking—much as with the subject Beaufort Inlet wreck— and regarding another British ship, the HMS *Columbine* (A.D. 1803) this included cabin framing and planks (Newsom, laboratory data). The Scots or *sylvestris*-type pine was also among the building materials used to construct or repair the Beaufort Inlet ship, and the block of wood and wood chip mentioned earlier may well represent debitage from the original construction process if not subsequent maintenance and carpentry activities. The marlinspike, part of a ship's equipment to secure lengths of rope, was also made of the *sylvestris*-type or Scots pine, and may have been among the original items on board the vessel (i.e. as a European-built, even French vessel).

Other pine specimens from the Beaufort Inlet wood assemblage classified to either the *sula* or *ponderosa* anatomical groups may also represent timber material or lumber originally harvested in Europe. The *sula* type of pine was also identified on the HMS *Columbine* (belaying pin, decking, stringer, wedge) and on earlier Spanish wrecks (sacrificial sheathing from *El Infante* and a stock from the *San Jose*, both wrecked in a 1733 hurricane) (Newsom, laboratory data). Conversely, those specimens from the Beaufort Inlet wreck that were classified to the fourth pine anatomical group, specifically the *taeda* group (southern hard or yellow pines), are most likely or absolutely American in origin. Indeed, southern pine forests are the dominant plant communities in the Carolinas coastal plain region (Atlantic and Gulf Coastal Plain Province [Barbour and Christensen 1993; Thorne 1993]), and the closely related Caribbean pines belong to the same anatomical group. The fact that all of the *taeda*-type pine from the wreck site is among the various miscellaneous wooden objects and not the ship-construction elements, in contrast to the other pine taxa from the site that have a more definitive association with the wreck, is consistent with the interpretation of ship as having been built in the Old World. Furthermore, that the *taeda* pine material includes plywood suggests that all or some of the specimens are intrusive, although certainly American species, especially long leaf pine (*Pinus palustris*), were valued for lumber and other purposes, including ship construction and repair, by the early eighteenth century when the Beaufort Inlet vessel appears to have wrecked. This type of pine is commonly associated with later vessels constructed in American ports, e.g. the CSS *Gaines* (floor, “outer hull”, bilge ceiling, futtock) and the CSS *North Carolina* (floor timber, “outer hull”) (Newsom, laboratory data).

Regarding other taxa identified from the Beaufort Inlet wooden artifact assemblage, it is interesting that both tompions from the cannons were identified as softwoods (the pine family, pine and probable fir). These particular genera (or conifers in general) were perhaps preferred for this use

specifically because as resinous woods they may have provided a good seal and tight fit, which would have been desirable to exclude seawater and debris from entering the cannon barrel (Wilde-Ramsing, personal communication). Considering beech, *Fagus* sp., the fuse identification, we note that the wood is considered to be hard and durable, and the uses are varied but typically have included items such as boxes and crates, furniture, flooring and trim, turned products, brushes, and more (Record and Hess 1943:166; Tubbs and Houston 1990:330). Perhaps especially relevant to the present identification is its use for flammable products: in creosote production, charcoal, and fuelwood. According to Tubbs and Houston (1990:330), beech “is especially favored for fuelwood because of its high density and good burning qualities.” As far as shipwreck identifications are concerned, we have previously identified beech as floor timbers from the Rose Hill shipwreck (1700 – 1775) and pump parts from *Henrietta Marie*, ca. 1715 (Newsom, laboratory data).

Black olive (*Bucida buceras*)—the wood of the north anchor stock and probably also the forked roundwood object (QAR366.059) – is a fairly common tree in the Caribbean islands and adjacent shores, a dense tropical hardwood. Some are very large and stately, reminiscent of southern live oaks, and the wood is described as moderately to very heavy, hard, and strong, as well as resistant to decay (Record and Hess 1943:128). The timber has been used for poles, posts, railway cross-ties, piling, and other durable construction, among other things (Record and Hess 1943:128), and thus would have been very well suited for use as an anchor stock. Given that the forked object represents this same or a closely related taxon that does not naturally occur at the latitude of the wreck, it is likely to have been on board the ship as an artifact (now too water-worn and eroded to discern a use or function), or as dunnage, if not transported naturally as part of tropical drift via the normal northward flow of the Gulf Stream.

Finally are the set of conifers present among the miscellaneous wood items, i.e., cedar family (e.g., white cedars), cypress (bald cypress), and red cedar, along with the *taeda*-type pine mentioned previously. These are in all probability, like the *taeda*-pine plywood and the sand fence slats (*Populus* sp.), only secondarily associated with the wreck (i.e., intrusive), although some could certainly have been utilized for one reason or another and were on board ship when it was grounded. White cedar, and particularly cypress and red cedar are native trees that, like the southern pines, are common in the southeastern Coastal Plain flora, including coastal wetlands and other near-shore environments (McWilliams et al. 1998; R.W. Phillips et al. 1998) from which they could have washed and floated onto the wreck site as is undoubtedly the case with the plywood and sand fence fragments. Nevertheless, red cedar, white cedar, and cypress, all have been identified as construction elements on several nineteenth to early twentieth-century shipwrecks investigated in the area (NCUAB2004).

Summary and Recommendations

The Beaufort Inlet shipwreck wood assemblage as a whole provides some insights into ship construction, specifically the woods selected and preferred for that purpose, as well as for the manufacture of various wooden objects. Although we cannot specify with certainty that the combination of woods in the wreck assemblage precisely fits the profile of particular known shipwrecks of either Old or New World origin, the assemblage nevertheless provides some possible indications of origins or affinities. The white-type oak, potentially representing species commonly used on both sides of the Atlantic and generally indistinguishable as to separate species, therefore geographic regions, offers little in this regard. However, the most parsimonious explanation or conclusion about origins based especially on the pine taxa, is that the ship was built or at least repaired in a European or Mediterranean naval yard. In our experience, the *sula*- and *sylvestris*-type pines are commonly or exclusively associated with Old World vessels and are not typically (if at all) associated with those constructed in American ports, e.g. Civil War era ships. Conversely, the *taeda*-type pines—which may only be incidental to the Beaufort Inlet wreck assemblage—are commonly identified from American vessels. Though pine of this type was identified from the Beaufort Inlet shipwreck, in no case was it determined to be part of the structural components. The black olive (*Bucida*) anchor stock must have been a replacement, since it is a West Indian wood.

Possible suggestions or directions for future research, both on the Beaufort Inlet site itself and more generally, include to recover samples of bilge sediments that may yield plant remains (seeds, pits, nuts, rinds, etc.; remnants of edible plant foods, provisions) that could provide evidence of the ship's history, i.e. serving more or less as a record of her travels (hypothetically tracing routes from Europe, to West Africa, through the Caribbean, and along the Atlantic seaboard; e.g. Smith et al. 1995). Another potential avenue for future research would be to revisit (re-examine) previous identifications of “red pine” (*sylvestris*-type) from other ships to see if any of the wood conforms to the Scots pine type, providing another basis to compare closely with the Beaufort Inlet wood assemblage.

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