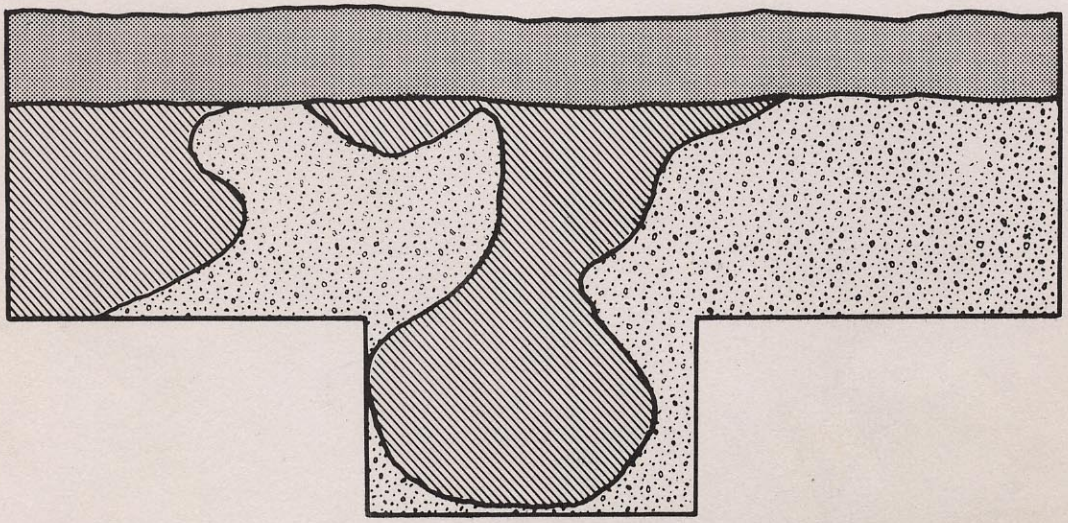
The Donnaha Site

1973, 1975 Excavations



by

J. Ned Woodall

with contributions by

David S. Weaver
Lisa G. Eppley

North Carolina Archaeological Council
Publication Number 22

HALL

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ACKNOWLEDGEMENTS

Work at the Donnaha site began late in 1972, and has continued, at varying speed, to date. These 12 years have seen many persons involved in the project, more than I can mention here. I would thank the landowner, Miss Eugenia Poindexter, and the lessees, William and Archie Doub, for their indulgence and interest in our work. The late Agnes Doub and Samuel P. Poindexter assisted in constructing the history of the site area.

My colleagues at Wake Forest University have helped in identifying artifacts, assessing the prehistoric environment and assisting in specialized photographic work. These persons include Ron Noftle of the physics department, Ronald Dimock, Peter Weigl and Raymond Wyatt of the biology department and Philip Perricone of the sociology department. Richard McWilliams, now of the University of Nebraska, helped in the original surveying, excavation and analysis of the human skeletal materials, and David Weaver has continued this work since 1977. At other universities, David Phelps of Eastern Carolina University identified the marine shells from Donnaha and Joffre Coe of UNC-Chapel Hill provided information on the Rights collection, a portion of which came from Donnaha. Others assisting in the research were Tom Padgett (N.C. Department of Transportation), Milton Davenport (Southern Railroad Co.), veterinarian David Harris, Capt. W. D. Carr (U.S. Marine Corps), Eugene Fabrano (U.S. Geological Survey), and Paul Raber (Pennsylvania State University).

Special thanks are extended to Joe Matthews of the Northwest Piedmont Council of Governments. His abiding interest in the cultural resources of this area, coupled with his ability to translate that interest into action, has made our work easier and more gratifying.

Many students have contributed to the Donnaha research, either through special analysis, laboratory assistance or field work. Cathy Bolton performed the soil analysis, while Bryan Curran, Chris Espenshade, Dave Foulke, Kerry Kesler, Keith Phillips and Richard Siebert assisted in the human skeletal analysis. In the Archeology Laboratories the following persons have served in various capacities: Lee Abbott, Karen Barnette, J. T. Cardwell, David Carlson, Stephen Claggett, Susan Correll, Glen Dennis, Lisa Eppley, Jacqueline Fehon, Susan Garrett, Susan Myers, Judith Newkirk, William Rasch, Erica Sanborn, Elizabeth Shattuck, Michele Vacca and Jeanne Watson. The 1973 field party consisted of Jacqueline Fehon (crew chief), John Browning, James Caywood, Ann Charbonneau, Charles Decker, Charles Ford, Paul Gulley, David Hawkins, Janet Head, William Hudson, Stephen Siebert, Lynn Linthicum, Ann Ludlow, Richard Mundorf, William Northington, Nona Porter, Milton Pyle, Ines Rapela, Anne Rodgers, Nancy Weaver, Joseph Westervelt and Jan Zachowski. In 1975 the field party was Kate Spielman (crew chief), Martha Ashman, Joan Bleacher, Malcolm Boswell, Gary Coleman, Vanessa Coleman, Linda Gard, Mariano Gomex, Linda Groffie, Brad Leftwich, Elizabeth O'Brian and Eileen Tusa.

Preparation of this report was aided by on-going discussions, arguments and rambling theoretical talkfests with Alan Snavely and Ira Beckerman, Pennsylvania State University graduate students also working in the Archeology Laboratories.

Despite all the help I have received the following report will contain errors and omissions. While I am convinced these are the fault of someone else, I must be held responsible.

J. Ned Woodall
Archeology Laboratories
Museum of Man

FOREWORD

The following report is a preliminary statement based on 9 weeks of field work at the Donnaha Site, a Late Woodland site in the northwest Piedmont of North Carolina. Since this report was drafted another six weeks were spent at the site, collecting data to address problems which had become obvious in our previous analysis. These more recent data--at least in their present undigested state--do not change any conclusions or interpretations offered in these pages, so it was decided that rather than further delay issuance of this information by incorporating the 1982 work, we would present the earlier findings as is, with a final report planned for a later date.

The final report also will incorporate results of several separate studies now underway as Masters theses, including research on faunal remains, ceramics and lithic studies, and an in-depth analysis of contents of the excavated "refuse pits." Rather than anticipate the results of these studies, I have inserted only brief summaries of these materials based on limited samples, with caveats provided as necessary.

ARCHEOLOGICAL BACKGROUND

The Indians that created the Donnaha Site were living near the end of a 12,000 year time period which began with the first entry of people into the Carolinas, and ended with the European destruction of the native cultures. Although remnants of the Piedmont's Indian people survived here and there, their traditional cultures were forever shattered during the 18th century. Except for the scanty travelers' accounts, and some evidence provided by linguistic traits and Indian oral history (Mooney 1894), all information regarding those traditional cultures has been gathered by archeology. These archeological data are subject to varying interpretation, and some may disagree with details of the following account although not, I think, with the general historical framework it provides.

North Carolina's first known inhabitants probably arrived about 10,000 B.C. They were few in number and shifted their camps often, but occasionally they left behind a distinctive stone spear point, the Clovis point. Clovis points occur across most of the United States and southern Canada, and down into Mesoamerica. In several places west of the Mississippi they are present in skeletons of now-extinct animals, especially elephant, but in the eastern U.S., including North Carolina, the points usually are found on the ground surface. In the West, Clovis points are found to date between 10,000 and 9,500 B.C. and because of the close similarity in form those of North Carolina likely date about this same time. We know very little about the Clovis cultures in North Carolina; they may also have hunted elephant or other Ice-age creatures, but we have no evidence.

By 8000 B.C. the last major glacier to advance on North America was in rapid retreat, and the plants and animals of North Carolina were assuming their present-day form and distribution. Descendants of the Clovis people changed their culture as well, producing a shorter, wider spear point called Hardaway (Coe 1964:64). The Hardaway point initiates a long stage of cultural development in the North Carolina Piedmont, the Archaic stage, which lasted until about 500 B.C., later in some areas. Most archeologists view the North Carolina Archaic as an 8000 year period of cultural stability, punctuated only by changes in spear point shapes, the addition or deletion of other tool forms, and subtle alterations of site location and site size. The diet was reliant on wild foods, although this is indicated more by site location than actual food remains. It now seems that some domesticated plants may have been grown during the final 2000 years (Yarnell 1976), but these did not significantly alter the basic cultural pattern. There is evidence that the Archaic population of the North Carolina Piedmont was growing, however (Ward 1983:66-69; Oliver 1981:26-27), and that trend may have considerable importance for understanding the end of the Archaic stage.

A gradual population increase during the Archaic stage holds considerable attraction as an explanation for at least some of the changes that occur during and following 2000 B.C. After about 6000 B.C. more intensive use of local food resources is in evidence, resources which

heretofore likely were ignored because of their requirements, in time and energy, for collecting and processing, and their relatively low food value (Claggett and Cable 1982:37). Also in many areas the raw material used in making stone tools is of poorer quality than before, perhaps reflecting more confined territories for the human bands and the loss of easy accessibility to high quality rock. In the final 2000 years of the Archaic the appearance elsewhere in the East of native domesticates such as sunflower and chenopodium, and squash (introduced from tropical regions) may reflect attempts to deal with the problem of more and more people drawing on the supply of wild foods. Certainly by the late Archaic, about 2000 B.C., Piedmont sites are larger and sometimes contain bulky, heavy items such as soapstone bowls, suggesting greater permanence of site location and perhaps smaller band territories.

About 0 A.D., certain portions of the Piedmont began to experience a major change in the cultural systems. The interriverine uplands, the area where Archaic sites are most abundant, seem to have been largely abandoned for settlements along larger watercourses. In some instances these riverine locations had been occupied previously, but now almost all habitation sites are situated adjacent to large creeks or rivers; only the occasional hunting camp or other temporary specialized site occurs in the uplands. If this settlement shift is in part a consequence of demographic processes at work we should expect the shift to vary from region to region in its timing, as local conditions intervened to accelerate or delay the move. In the Great Bend area of the Yadkin Valley the shift was apparent by A.D. 500, largely complete by A.D. 1000. Causes for the settlement shift remains a lively concern--current explanations involve greater use of riverine resources (fish, shellfish, aquatic animals) and cultivation of the sandier soils along the river banks, with continued use of game and vegetable foods from the upland regions. Along with the settlement pattern change come small triangular projectile points indicating the bow and arrow are in use, and the production of pottery. This complex of new traits initiates the Woodland stage in the central Yadkin Valley, and the Archaic stage is at an end.

Woodland sites are numerous along the Yadkin River in the region of the Great Bend. Ceramics collected from these sites consist of Yadkin, Uwharrie and Dan River series, indicating a period of occupation from, roughly, A.D. 600-1500, perhaps later in a few sites. The Parker Site, located in Davidson County about 40 km south of Donnaha, was extensively tested by Wake Forest University in 1971 and 1972. The overwhelming majority of potsherds from this site were of the Uwharrie series, and two radiocarbon dates indicate the occupation was between A.D. 600 and A.D. 1000 (Newkirk 1978). The Parker Sites's Uwharrie sherds are identical to those in the lower levels of Donnaha, but during the Donnaha occupation this series gives way to the Dan River types, the change occurring between A.D. 1000 and A.D. 1500, dates consistent with data from Virginia and other North Carolina sites (Gardner 1980:10,81). Coeval with the upper levels of Donnaha, and continuing into the historic period, the two components of Upper Sauratown (31Sk1 and Sk1a) complete the Woodland sequence. Upper Sauratown is on the Dan River, not the Yadkin, but the trends in ceramic variability represented at the Parker and Donnaha sites are continued there, terminating finally in the 18th century.

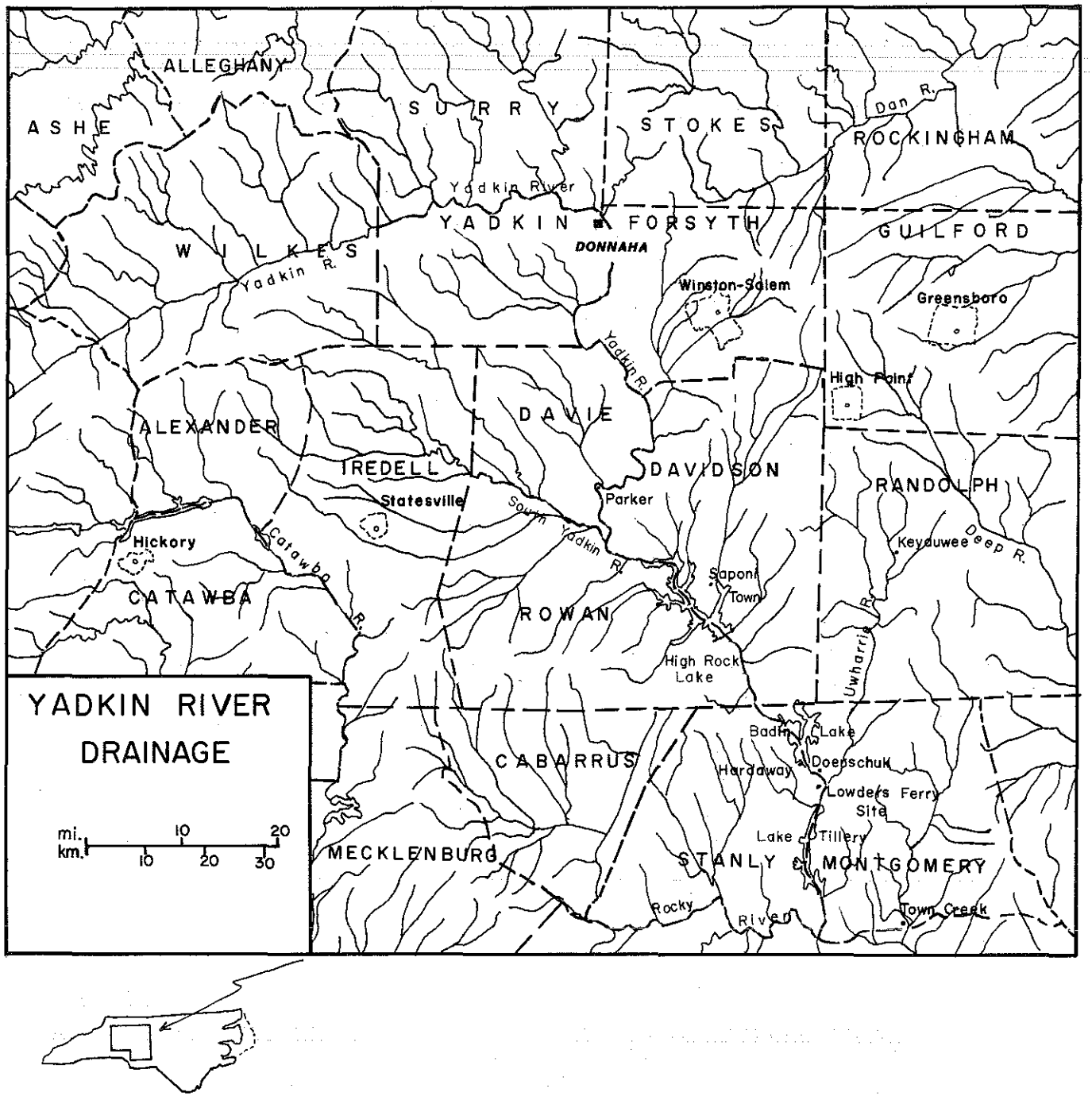


Figure 1. Location map of the Yadkin River drainage and the Donnaha Site (31Yd9).

THE NATURAL SETTING

The River

The Donnaha Site (31 Yd 9) occupies the crest and flanks of a natural levee of the Yadkin River, situated in the active flood plain in Yadkin County, North Carolina. At Donnaha the Yadkin has formed a wide bend to the east and flows along the eastern margin of its valley, thereby producing an unusually large, elliptical expanse of bottomland of about 100 hectares on its west bank. Following the curve of the river here, a muddy 60 meters wide, the arcing levee crest is 50-100 meters from the water edge and is backed by a broad expanse of backswamp deposits, these finally terminating at the upland fringe beyond. In both a natural and cultural sense the river played the major role in creating Donnaha, and its dynamics are important in the site interpretation.

The Yadkin River begins on the eastern slope of the Blue Ridge Mountains some 135 km west of Donnaha. Forced east-northeast by the resistant quartzite and granite of the Brushy Mountains and the marbles of the King's Mountain group, the river makes its "Great Bend" upon leaving these resistant rocks in the northeast corner of Yadkin County (Fig. 1). The bend turns the stream to the southeast until, as the Pee Dee, it enters the Atlantic near Myrtle Beach, South Carolina.

The resistant rock of the King's Mountain group results in a narrow, steep-sided valley for the Yadkin, but as the river breaks into the softer gneisses and schists, 2 km upstream of Donnaha, a trend toward broader river bottoms is seen, a consequence of greater Holocene meandering across the softer beds. In those broader floodplains (of which the Donnaha Site bottom is the most prominent), periods of overbank flooding incur increased alluviation of the soils. That is, as the floodwaters spread over these larger bottoms the velocity of stream flow accordingly decreases, and particles which would be carried in suspension in a narrower valley settle out as (first) the sands of the levee adjacent to the river and (finally), in the more placid flow farther from the river, as the heavy silts and clays of the backswamp. To illustrate the change in floodplain topography: beginning at the northern edge of the Donnaha Site bottom--marked by the Yadkin tributary, Miller Creek--and continuing upstream 13 km to the mouth of the Ararat River there are approximately 126 hectares of alluvial deposits on the right bank of the river, only 26 hectares more than is present in the Donnaha bottom alone! Nor is the upstream left bank flood plain any wider, but similarly shows constriction until the Great Bend is reached (Curle 1962, Davis 1937). Neither in the Donnaha Bottom, nor elsewhere in the Great Bend area are there meander scars or oxbow lakes.

Today the levee crest at Donnaha stands 6 meters above the backswamp, sloping to meet the backswamp at a 6 degree angle, a 1:10 rate. The riverine slope is much steeper, having been affected more by minor flooding and consequent erosion. The backswamp slope certainly has been altered by some 200 years of plowing, and in prehistoric times probably was steeper than at

Figure 2. Aerial view of the Donnaha bottom (1"=275m).

present. As will be seen in the discussion of site stratigraphy, Donnaha was experiencing minor aggradation on the levee crest and the backswamp slope during the site occupation, and periodic erosion on the riverine slope. Not until historic times, however, is there evidence of major flooding and deposition, probably a consequence of recent deforestation and extensive bottomland cultivation, in turn leading to a raising of the river bed and an increase in its silt load.

Miller Creek is a peculiar stream today, emerging from the hills northwest of the site and pursuing a straight course across the floodplain, then turning upstream to enter the river 1 km above the midden center. Upon questioning local informants in this regard, it was learned that at one time the stream, after entering the floodplain, flowed parallel to the Yadkin through the Donnaha backswamp and entered the river channel at the downstream terminus of the floodplain, near the island (Fig. 2). Its present course was created to allow easier cultivation of the bottomland, and its role in draining the backswamp was assumed by the blind ditches and narrowly excavated drainage channels now present.

The Soils

The Donnaha bottom presents a mosaic of soils, all of alluvial origin, belonging to the Buncombe, Chewacla and Congaree series. The site levee is composed of Buncombe loamy sand, which grades to Congaree fine sandy loam some 200 meters from the river, along the riverine edge of backswamp deposits. Beyond these heavier soils, 300 meters from the river, is another strip of Buncombe loamy sand. This deposit forms a slight elevation in the floodplain, probably a levee remnant created when Miller Creek flowed in its natural course. Backing this soil and extending to the edge of the uplands--a distance of 260 meters--are the heavy silt loams of the Chewacla series, interspersed along the floodplain margin with fans of colluvial soils derived by sheet erosion from the uplands. The uplands fronting the floodplain are moderately sloping hills of gneiss and diorite, weathered to soils of the Lloyd series. Uplands almost surround the Donnaha bottom; they extend to the river at the downstream terminus of the floodplain, and encroach to within 250 meters at the Miller Creek confluence. Beyond Miller Creek the floodplain gradually constricts, disappearing finally at the apex of the Great Bend (Fig. 2). It should be noted that the bottomland tract described is a near isolate or "island," surrounded by the river and the uplands on all sides except the northwest, where the floodplain diminishes markedly. The relationship of this topography to the observed settlement-subsistence pattern will be discussed later.

Buncombe soils are deep and friable, with low organic content and low fertility; they are droughty and strongly acid. The Congaree soils have moderate amounts of organic material and fertility, and are "medium" in regard to waterholding capacity and acidity. The Chewacla soils, specifically Chewacla silt loam, are poorly drained, highly acidic, with moderate amounts of organic matter and plant nutrients (Curle 1962). Thus, the Donnaha bottom presents a continuum of soil textures, with the most friable, sandiest and least fertile adjacent to the river (the levee), with increasingly finer

particles (silts, clays) as one moves away from the stream toward the uplands. The gradation is interrupted only by the strip of Buncombe loamy sand between the Congaree soils and the "true" backswamp of Chewacla silt loam.

At present the Lloyd loams adjacent to the floodplain are variously classified depending upon their slope and the extent of erosion. Since most of this has occurred in recent years (Trimble 1972), the finer distinctions probably are of little significance concerning the prehistoric period. Lloyd loam is a deep, well-drained and friable soil with the parent gneiss and diorite found at depths greater than 1 meter.

Buncombe loamy sand is one of the poorest agricultural soils in the county. Congaree and Chewacla deposits are above average or average for crops but require artificial drainage and are subject to flood damage (Curle 1962:16).

Congaree soils, like Buncombe, are acid, with a pH range from 5.6 to 6.0. Soil acidity is a major variable affecting preservation of bone and shell in archeological sites, and Donnaha is unusual in regard to the excellent condition of these materials. The calcium phosphates of shell and bone normally are attacked by the acid soil with the release of free phosphoric acid. In the absence of sufficient bases to re-fix it as insoluble, the phosphoric acid is leached out in the drainage (Cornwall 1958:95). The pH range at which rapid leaching occurs seems to be between 5.0-7.0 (Ahler 1973:116. Cook and Heizer 1965:12). Six soil samples obtained from Donnaha and the vicinity were analyzed for ph and phosphorus content. Except for the sample taken from the midden, all soils were acid, ranging from 5.7 to 6.7 pH and 1.0 to 15.0 phosphorus ppm. In contrast the midden soil had a pH of 7.6 and phosphorus of 19.0 ppm. All this land has been limed by farmers, but in the Donnaha bottom lime application has been applied evenly, hence is not the cause for the variation (although it may have affected the pH values). The primary cause is the abundant bone and especially mussel shell in the midden. Phosphorus has been released from this refuse in a number of valency states--PO_4, HPO_4, and H_2PO_4--all of which are basic (Limbrey 1975:70). Thus the discard behavior of the Donnaha occupants changed the soil pH so that leaching of the organic phosphates was inhibited, and excellent preservation of bone was obtained.

The Minerals

Based on the excavation results at Donnaha there are seven stone types used by the inhabitants: quartzite; quartz; jasper; various felsic rocks including rhyolite and andesite; argillite; chalcedony; chert; and steatite. Quartzite is abundant in the Kings Mountain formation immediately upstream of Donnaha, which no doubt is the source of the quartzite cobbles that pave the river banks and bed in areas near the site. Likewise quartz is available in the vicinity, occurring as seams in the red clayey soils of the uplands. Quartz veins are common in the crystalline gneisses and schists which underlie and produce the red clays of the uplands, but the harder vein quartz decomposes more slowly than its matrix (Stuckey 1965:375). Consequently, veins of quartz occasionally appear on the surface in the vicinity of the

site--one is visible in a road cut on the uplands slope leading into the Donnaha floodplain. The third stone available locally is soapstone, an impure, soft rock containing talc and various other minerals such as chlorite, serpentine or magnetite (Stuckey 1965:455). In the Piedmont, soapstone occurs as small, isolated outcrops, and the surface materials usually are broken and scattered. One such outcrop is present 8 km southeast of Donnaha, across the Yadkin River in Forsyth County; another is found 13 km south of the site, also in Forsyth County; a third is in Yadkin County, on the right bank of the river, 15 km southwest of Donnaha. The nearest known source is 6 km south-southwest of the site, near the Yadkin County community of Flint Hill. Local informants speak of a soapstone quarry here exploited in historic times for fireplace lining, and the rock was said to be abundant on and just beneath the surface. According to Ferguson (1980) soapstone outcrops in the Piedmont assume a linear pattern in conformity with the general strike of regional bedrock formations. Projection of the strike line formed by the four known outcrops as suggested by Ferguson (1980:112) would carry some 6 km east of Donnaha. In any case, this resource was available within easy walking (and perhaps some swimming) distance of this site.

Felsic rock and argillite are not available from natural sources in the Donnaha vicinity. These metavolcanics originated in the Carolina Slate Belt some 55 km or more to the east. The Carolina Slate Belt (an acknowledged misnomer) is a 45-85 km wide belt of metavolcanics interspersed with intrusives and sedimentary materials, trending southwest to northeast across the eastern Carolina Piedmont. Generally of volcanic origin, the Slate Belt consists of metamorphosed lava flows interbedded with beds of ash, tuff, breccia and shale or slate, along with nonvolcanic materials such as mud, silt, sand and conglomerate (Stuckey 1965:94). These various materials do not occupy definite stratigraphic positions in the formation (Stuckey 1965:95). Also the rate and conditions of the cooling process determine the rock composition, adding to the high diversity of rock across the Slate Belt or within a single quarry locale in the formation (Claggett and Cable 1982:185). Composition of the rocks varies from fine-textured tuffs and flows to coarse-grained mafic volcanics (Stuckey 1965:97). Of course it is the cryptocrystalline deposits that are of primary concern here, since these are best suited for knapping.

The chalcedony occurs in botryoidal form near Danbury (Stokes Co., N.C.), on a tributary of the Dan River. This is the nearest known source, 35 km northeast of Donnaha. Chert, especially the very dark, lustrous "Knox chert", probably originated in the Ridge-and-Valley province of Tennessee or possibly western North Carolina. One source, perhaps the nearest, is 150 km to the northwest near Abingdon, Virginia.

Flora

The North Carolina Piedmont is part of the Carolinian Biotic Province of Dice (1943) and the Temperate Deciduous Forest Biome of Shelford (1963). Prior to the extensive timbering and farming which began in the 18th century, the interfluvial uplands around Donnaha probably supported a climax oak-hickory forest. The pines now abundant in the uplands were rare in the climax

community, but were persistent in a low frequency (Oosting 1942:51). Also present in small numbers were tulip poplar, red gum, juniper, sassafras, persimmon, black cherry, sourwood, ash, elm, holly, ironwood and dogwood, all part of the understory in a mature upland forest (Oosting 1942:95).

Today the Yadkin County floodplains are intensely cultivated and the backswamps are drained by ditching. Prior to the Euro-American intrusion the floodplains maintained an alluvial forest dominated by more water-tolerant species than those found in the adjacent uplands. Because undisturbed climax communities in river bottoms are rare, the content of the prehistoric alluvial forest at Donnaha must remain uncertain. Using data from elsewhere in the Piedmont, however, some projections can be made. Forty km to the south the alluvial forest is recorded as dominated by river birch and box elder with a diverse subcanopy of sycamore, green ash, hickory and elm (Duke Power 1974:2.7-2). In the eastern Piedmont, investigations along the Haw River of Chatham County defined an alluvial forest of river birch, sweetgum, ash, sycamore, box elder, hackberry, red maple, sugar maple, hickory and loblolly pine, and a "swamp forest" (presumably in the backswamps) of five oak species, hickory and elm (Claggett and Cable 1982:85). Probably the most accurate assessment of floodplain vegetation was compiled by Oosting (1942), who found a 20 hectare stand of undisturbed forest in the floodplain of the Eno River, north of Durham and about 130 km east of Donnaha. This "postclimax" forest is dominated by willow oak; red gum; swamp, red, and white oak; and minor numbers of hickory and pine. Hard maple was abundant in the understory, so evident as to lead Oosting to describe the postclimax alluvial forest as oak-hickory-hard maple. In this setting 32 herbs are listed, almost all of moderate or low frequency, i.e. a diverse community. Fifteen of the genera listed have recorded use by North American Indians (Yanousky 1936). Oosting notes that only slight variations in the perfection of drainage result in very different moisture conditions in floodplains, and these differences may be reflected in the vegetation type to a marked degree. Thus the variability of the soils and elevations in the Donnaha floodplain mentioned earlier must have created a quite diverse floral community within the site catchment.

No attempt has been made to systematically study the botanical remains from Donnaha, although this is a recognized requirement for an understanding of the subsistence pattern. At present we have recognized remains only of hickory and black walnuts and persimmon seeds; the only domesticate identified is maize -- a complete charred cob was recovered by the 1982 work.

The present levee which contains the site proper is, as mentioned, the most elevated land in the bottom and is built of Buncombe loamy sand, low in natural fertility. This, too, probably was in trees prior to the site occupation but seemingly was cleared by the occupants. The levee was being built and eroded during the occupation, and an alluvial thicket likely was the response to continuing disturbance by the river and the Donnaha inhabitants--the site stratigraphy showed few instances of stains left by decayed tree root systems.

Fauna

With three major environmental zones available for exploitation--uplands, floodplain and the Yadkin River--the Donnaha inhabitants had access to a wide variety of animals. A broad spectrum hunting-collection strategy is reflected by recovered faunal remains.

The most important terrestrial animal was the white-tailed deer, abundant in the climax and postclimax forests of mast-producing trees. Also available were turkey, squirrel, rabbit, opossum, skunk, fox, elk and bear. Exploitation of the alluvial forest would add raccoon, various members of the genus Mustela, beaver, and the several amphibians and reptiles present, most notably the box turtle or terrapin. From the river came otter, mussels, turtles, frogs, several species of fish, and (rarely) ducks, geese, and waders such as heron.

Analysis of the huge collection of Donnaha's founal remains is at an early stage, and does not yet allow an assessment of the full range of creatures taken nor their relative representation in the collection. Preliminary work, coupled with field observation, nevertheless indicates that white-tailed deer and wild turkey comprise the majority of the remains by weight. Also found are raccoon, gray squirrel, beaver, otter, gray fox, elk, skunk and the domestic dog. Identified fish include catfish, long-nose gar, redhorse and at least two perciformes; the box turtle (terrapine) is heavily represented, with snapping turtle and mud turtle also present, along with frog and snake remains. Bird bones remain largely unidentified save for turkey, black vulture, duck, Canadian goose and blue heron. Shellfish remains abound, all of the genus Elliptio.

SITE HISTORY

Today the Donnaha Site setting is a quiet farmscape, but during the last century and before it was a major thoroughfare in the western North Carolina Piedmont. The Donnaha bottom was purchased from one Bailey in the 1760's by Thomas Poindexter, and has remained in that family's ownership since. Poindexter's wife was named Elizabeth Pledge, daughter of Bettie and Bill Pledge (P.H. Poindexter 1907). Bettie Pledge supposedly was the issue of a Cherokee chief named Donahoo and an Englishwoman named Wentworth; it was in memory of this Indian ancestor that the name Donnaha was given to the 18th century village opposite the site in Forsyth County, and has now been used to denote the Yadkin County property as well.

On the first upland range directly opposite the site was the town of Richmond, begun in 1774 and chartered in 1779 (Woodall and Snavely 1975:27). Richmond was the location of the Surry County courthouse from 1774 until 1789, when Surry County was divided and the courthouse moved (McGraw 1977:23). This and later divisions created the present county lines--Richmond now is in Forsyth County. The town lingered until the 1830's, when it was devastated by a storm. At least one famous visitor at Richmond was Andrew Jackson, here admitted to the bar in 1787. Traffic to and from Richmond, and to and from the growing community of Salem crossed the Yadkin near the site. At an unknown date, but probably no later than 1800, a ferry was established at Donnaha with its Yadkin County terminus near the present dirt access road. Traffic west then crossed the southern end of the site and moved out of the bottom past the home site of Thomas Poindexter and his descendants, where a large spring was retained to water travelers and their horses (S.H. Poindexter, personal communication). Throughout the 19th century the "Poindexter" ferry continued in use, carrying people and, after 1890, mail and freight from the Southern Railroad depot at Donnaha Station. The Poindexter home was the scene for camp meetings held by circuit riding preachers, and a race track near the house is part of the Poindexter family lore. Thomas Poindexter reportedly constructed an "Indian fort" near his home which, while never used, was intended to protect his family and neighbors.

By 1910 the ferry was augmented by a toll bridge (Rutledge 1965:170), and a portion of this bridge still stands on the Yadkin County side near the site. This bridge was destroyed by the flood of 1916. The ferry continued to operate for a few years after that, but completion of a new bridge at the present crossing of Highway 67 lured traffic south of Donnaha. Coupled with the earlier demise of Richmond this resulted in the present-day isolation of the Donnaha bottom.

Evidence of an aboriginal presence at Donnaha in historic times is vague but persistent. Samuel P. Poindexter, now 62, states that his greatgrandfather, youngest son of the settler Thomas Poindexter, had remembered Indians present at the site. Rights (1947:272) claims to have found glass trade beads at Donnaha, or its vicinity, but none were recovered by the Wake Forest excavations or the numerous surface surveys of the site.

Excavations 3 km south of Donnaha, at the late 18th century Wright Courthouse, yielded several pieces of worked bottle glass, and at about the same time Indians were said to encamp periodically near the Doub Tannery, 8 km east of Donnaha in Forsyth County (Doub 1915). The Moravian Records account the presence of many Indians in the Yadkin Valley in 1760 and various Indian visitors or delegations in the 1770's (Fries 1922:229-233, 835), but there is no documentation linking these to the Donnaha Site.

THE 1973 AND 1975 EXCAVATION

Methods

The Donnaha Site excavations began in the winter of 1973, when a field crew of 21, two field assistants and I worked from 9 January through 27 January. A second season from 10 June through July 1975 used a crew of 10, two assistants and myself, along with several occasional volunteers. The primary objective of the first field season was to determine the horizontal and vertical extent of the site, define the stratigraphy and processes affecting it, and secure a sample of artifacts, features and other associated data. The second season was intended to enlarge this sample and isolate, if possible, the remains of structures. It should be emphasized that both seasons were organized with a "salvage philosophy" in mind. The damage caused by the flood of 1972 and the increasing depredations by relic hunters looting for burials had made the long-term survival of the site questionable.

Because there was no prior knowledge of Donnaha useful for developing a sampling strategy, our initial excavations in 1973 were directed by a random sampling procedure. Site limits were defined by a walkover survey, and the edges of the surface artifact distribution were marked by stakes and flagging tape. A plane table and alidade were used to map the distribution, and indicated an oval scatter--long axis paralleling the river--166 by 725 meters. The resultant map was gridded into 10 meter squares, and a table of random numbers was used to select squares for sampling. For a chosen square a 2 m square pit was excavated in the southeast corner. Twelve such tests were conducted, represented by excavation units (E.U.'s) 7-15 and 18-20 (Fig. 3). Six additional 2 m squares, E.U.'s 1-6, were opened in an area of abundant surface debris a short distance north of the dirt access road. While these squares were being excavated, a series of aerial photographs was made (delayed until then by snow cover) showing the dark, organic-stained midden concentration (Fig. 2 and Fig. 3). With the photograph available, we triangulated from existing E.U.'s and placed a series of trenches across the stain, beginning on the riverine slope and continuing onto the levee crest (E.U.'s 17, 22, 24, 16, and 26). This was intended to provide a long profile of the midden concentration, locate cultural features present, and secure an artifact sample of this part of the site. These trenches were expanded as necessary to expose and excavate the several features--mainly burials--discovered by the original E.U.'s, and these additional units included numbers 26-33.

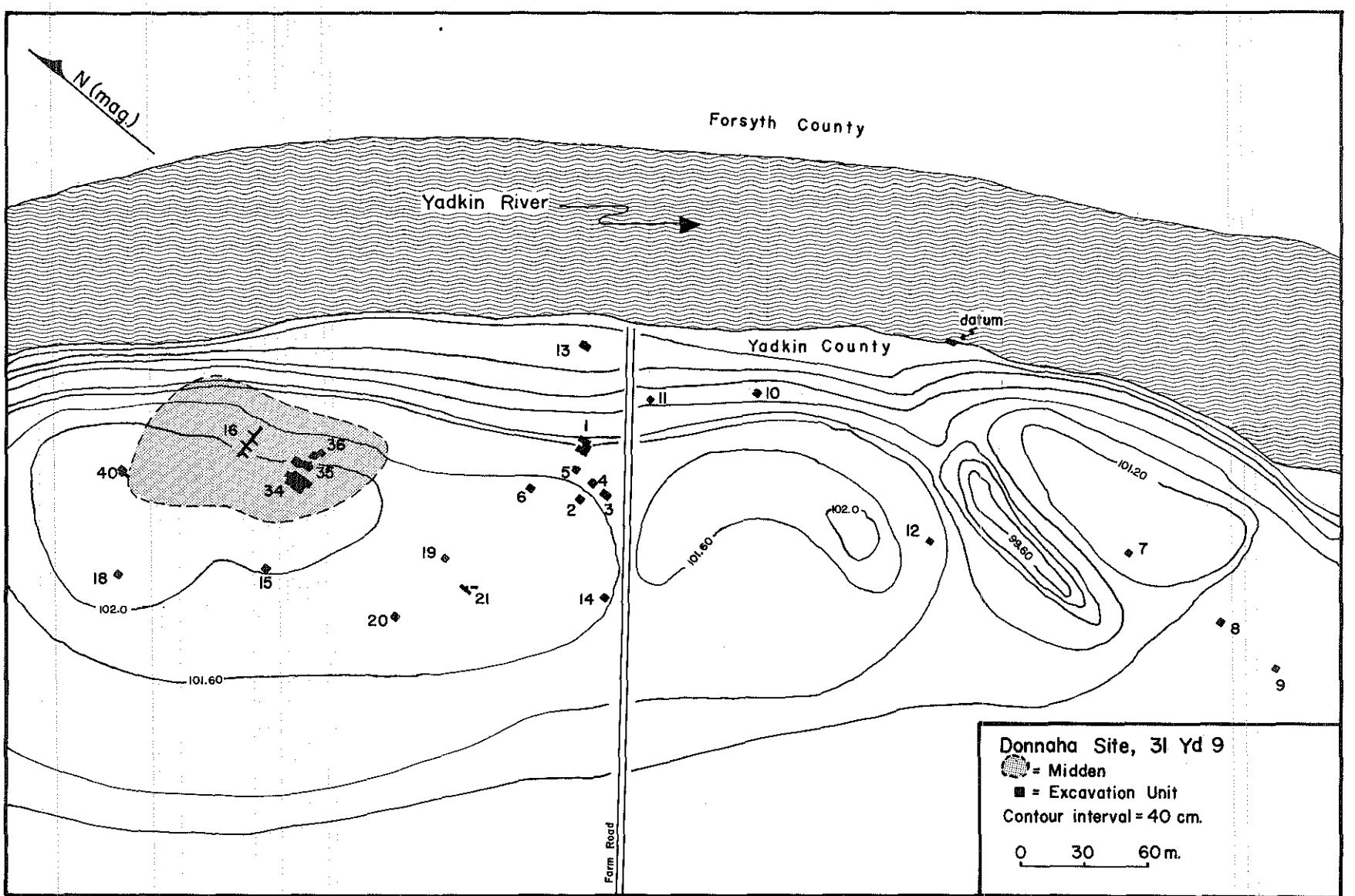


Figure 3. Map of the Donnaha Site (31Yd9).

Close examination of the aerial photographs showed a "halo effect" around the dark midden area, an oval stain lighter than the midden proper yet distinguishable from the background soils of the floodplain. Again by triangulating from existing E.U.'s shown in the photo, we staked and excavated a 1x4 meter trench, E.U. 21, on the fringe of this larger stain. The appearance of large postholes prompted additional excavations here (E.U.'s 23 and 25). Thus by the end of this season 33 excavation units had been opened, representing 140 square meters or .1% of the site as defined by the original survey.

The efficiency of the 1973 season was compromised to a minor extent by the winter weather. The access road provided no access, since the backswamp became a quagmire even for 4-wheel drive vehicles; the crew was transported each day by boat. One crew member was lost due to frostbite and another (temporarily) by a too-accurate snow/ice ball. With the temperature below -10° C, film became brittle and often broke in the cameras, and the ground usually froze each night to varying depths. Burials, once exposed, had to be excavated, recorded and removed in that same day, and frequent rain made mapping and profiling a frustrating effort. We vowed that the next field season would be in the summer.

In recognition that the Donnaha Site was a component of a settlement system in the Yadkin Valley, a survey of neighboring sites was undertaken in the summers of 1974 and 1975. These surveys (Woodall and Claggett, 1974; Woodall 1975), began at the mouth of the Little Yadkin about 2 km upstream from Donnaha and extended downstream 26.5 km to the Davie County line. Only the Yadkin floodplain was examined (on both sides of the river), and 123 sites were located or re-examined. Using these data, a settlement pattern analysis was carried out by Barnette (1978). Along with these surveys the U.S. Marine Corps conducted photographic fly-overs of the survey area. These were done at various times, altitudes, and angles, and proved especially useful in locating fish weirs in the river. (Later it was learned that one of these weirs, which extended between the Forsyth County bank and a small island near the highway 67 bridge, was used by commercial fishermen as late as 1889).

The 1975 excavation concentrated on the midden area, beginning with a eries of 1x4 meter trenches a short distance south of the 1973 E.U. 16 area. These excavation units, numbers 34, 35, and 36, subsequently were expanded as necessary to encompass the various cultural features encountered (Fig. 3). Other than these three units and their expansion, only one area was further examined in 1975: an effort to locate a palisade on the northern edge of the midden led to excavation of E.U. 40, which ultimately was expanded to allow recovery of several features (but no palisade remains).

Excavation procedures remained the same. Typically the plow zone was removed as a single unit, and the E.U. floor troweled for evidence of features. Detection of these was enhanced by misting the soil with a pressurized sprayer, also used effectively to record the vertical stratigraphy. Barring presence of features, the midden was excavated in 15 cm levels until sterile soil or, in one instance, groundwater was reached. The sterile sand was tested by digging a 30 cm deep hole approximately 50 cm

square to confirm the absence of cultural materials. The 15 cm levels were abandoned if a discernable stratum was found, and such strata would be excavated as separate units (for example the alluvial stratum present on the backswamp slope of the levee).

Within the midden stratum, features (usually pits) were detected by soil discolorations and/or the truncation of ash or shell lenses commonly present (Fig. 4). If such a pit was contained entirely by the midden stratum and filled by accretion, its definition was difficult, but those which penetrated midden and were backfilled (e.g. burials) usually mixed enough of the lighter underlying sands to provide ready recognition. These features were mapped as discovered and the contents removed separately, either as a single unit or by levels. A large-scale map was maintained for each E.U., and an overall contoured site map also was constructed using a plane table and alidade. Maps and field notes were augmented by both 35 mm black and white and color photographs. Polaroid photos were taken and appended to field notes to clarify written description, which consisted of a log book for each E.U. and standardized general data forms for each field specimen number assigned within the E.U.

Horizontal control was maintained by a grid system established in 1973 and re-set in 1975. A central stake was designated N500/W500 (500 meters north and 500 meters west of an imaginery datum), and the various E.U.'s were staked using a transit and 30-meter tape, with the coordinates of the E.U. referencing its SE corner. Thus E.U. 15 is N558, W632 (58 meters north and 132 meters west of the original stake). The permanent datum for the grid is the old concrete bridge abutment standing on the southeastern edge of the site.

Vertical control for artifact/feature provenience used two measurements, depth below surface and elevation above datum. Initially a grid stake was assigned an arbitrary elevation of 100 meters above datum, and subsequent stakes measured by transit and stadia rod above and below that point (e.g. 97.50 m above datum, 102.30 m above datum), with the bridge abutment elevation also serving as the permanent vertical datum. (Our arbitrary vertical datum can be corrected to an above mean sea level measurement so that 100 m above datum is 745 feet or 227 m above mean sea level).

Except for some exploratory trenches dug in the first season to solve a stratigraphic puzzle, all excavated midden soil was screened through 1/4-inch mesh. In addition, features noted to produce carbonized materials, fish scales or other items not usually recovered were sampled by obtaining a measured soil volume (usually 10 liters) for water screening through window mesh. Soil samples were obtained from burials and, occasionally, features for laboratory analysis. Pollen samples were taken from burials, broken vessels or "pot-busts" in trash pits and similar situations indicating primary depositional episodes, and a pollen column was taken at 10 cm intervals in a deep excavation of E.U. 34. At this writing the pollen samples have not been analyzed.

Figure 4. Pit outline in E.U. 40, Donnaha Site (31Yd9), 41cm below surface. (Note: the 31Yd1 designation shown in this and following figures is a temporary site number only).

Carbon samples were taken as available but charcoal was surprisingly scarce at the site, and many samples obtained were not useful for dating because of the disturbances described above. Only 5 samples were submitted, along with one sample of mussel shell.

Burials were recorded by large-scale drawings and photography, with exact orientation measured by a Brunton compass. Bones that could be removed with no damage were left untreated, but in several cases the skeletal remains were so friable that Gelva was applied prior to removal.

All recovered materials and related documentation are on file in the Archeology Laboratories, Museum of Man, Wake Forest University.

Stratigraphy

An idealized profile of the Donnaha Site would reveal rather simple stratigraphy consisting of a 20-40 cm plow zone underlain by a dark, organic-stained midden varying from 20 cm to 1 m or more in thickness; the midden is underlain by yellow to yellow-brown sterile sands which continue down to the water table, ca. 2-6 m below surface. Unfortunately, this uncomplicated sequence rarely was encountered, having been altered by both cultural and natural processes.

For example, on the backswamp slope of the levee two plow zones were found, separated by a stratum of near-sterile alluvium. The lower plow zone developed in the midden, but the upper zone also was in midden deposits (Fig. 5). Apparently this southern slope of the levee accumulated a midden either as primary or secondary refuse (Schiffer 1976:30) or, less likely, through incremental migration of materials washing from the levee crest. At sometime in the historic period this deposit was plowed to a depth of at least 20 cm and then capped with alluvium in a single flooding episode. Following this, continuing cultivation of the levee slope and crest moved midden deposits downslope, in turn covering the alluvium with a second plow zone. The present farmers of the Donnaha bottom, William and Archie Doub, have confirmed that the last 40 years of plowing have steadily decreased the relief on the backswamp site of the levee. As expected, no intact cultural features were found above the lower plow zone.

The other major cultural activity affecting the stratigraphy began with the prehistoric occupation and continues to the present, namely digging. Whether a consequence of the loose sandy soil, noxious vapors from the river or other incitements, the Donnaha occupants and their dogs excavated hundreds of pits. There are pits, pits in pits and pits through pits. Some were dug for human interments, some for dog burials; there are post holes for the structures, while other pits are filled with midden debris. Seemingly a few were excavated for practice. In many cases pits went undetected in our excavation of the midden stratum only to become evident as dark stains limned against the lighter matrix below the midden, so the overlying deposits underwent varying degrees of mixing incurred by the aboriginal digging. Within the last 50 years, and especially during the last 20, additional disturbances have been created by relic hunters. These recent pits are often

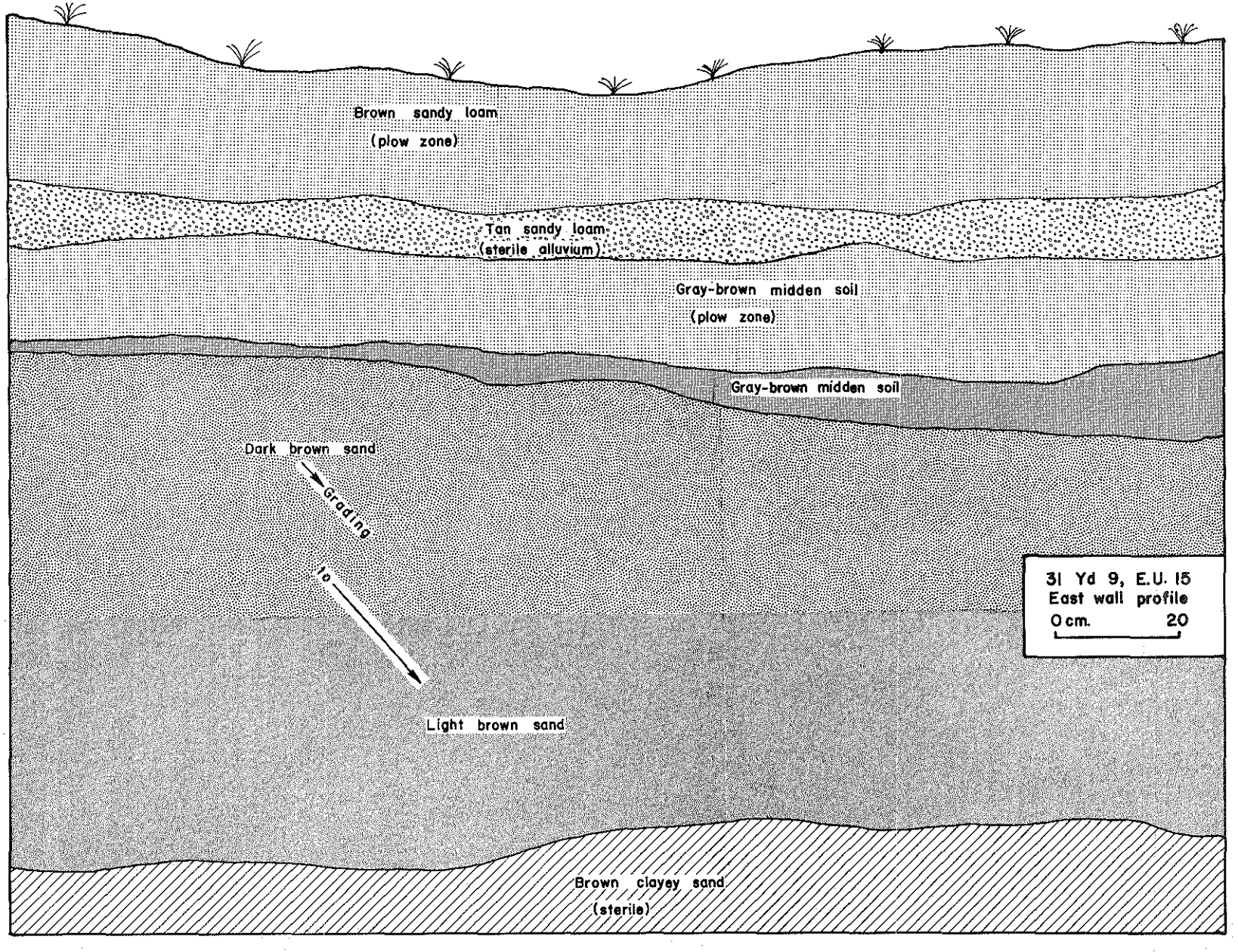


Figure 5. Profile of E.U. 15, Donnaha Site (31Yd9).

difficult to differentiate from aboriginal ones since continued plowing erases evidence of their surface origination.

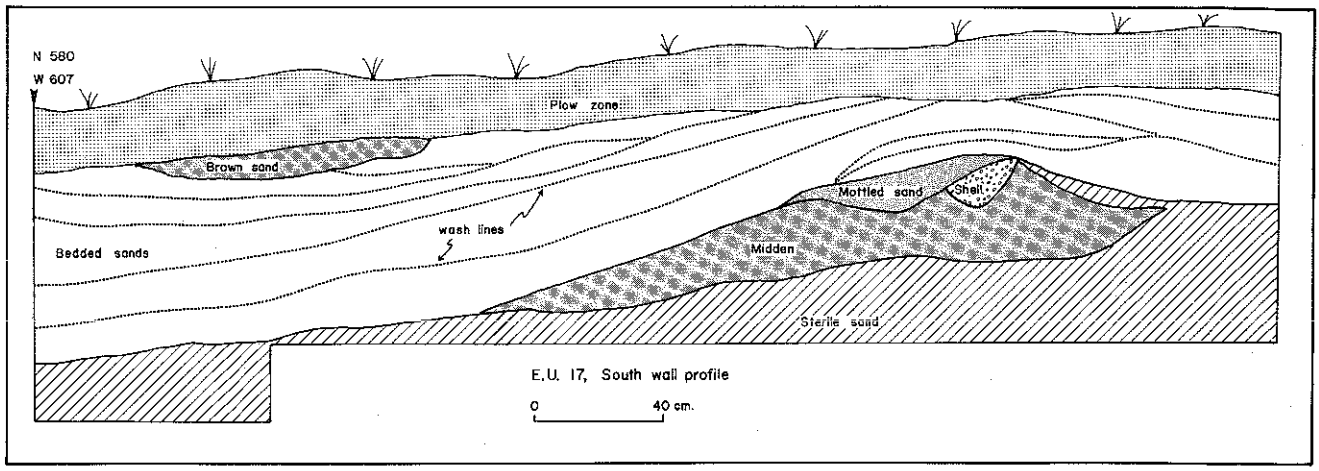
The major natural process affecting the stratigraphy is the Yadkin River in its periodic flooding and erosion of the levee. Twice in this century, in 1916 and 1940, the levee has been entirely covered and in several other floods only the levee crest remained above the water. Eyewitnesses to these floods describe the drastic effects they have on the integrity of the prehistoric stratigraphy. In the 1916 flood a small ferry-keeper's house was present near the river, just north of the dirt access road. Striking against the structure, the floodwaters began to eddy and erode the riverine slope of the levee, ultimately carving out a gully in this vicinity said to be at least 3 meters deep, 6 meters wide and 10 meters long. In June of 1972 rains of hurricane Agnes brought the Yadkin out of its banks and severely eroded the levee in two places, exposing two human burials. One of these was reported and salvaged (Snavely and Gorin 1972), while the other was lost to collectors. Purportedly the 1940 flood also exposed several burials with abundant artifacts, including at least one complete pottery vessel.

The action of floods on the site in the last century and before is impossible to retrodict because the erosion-aggradation relationship is, to a large degree, determined by chance. For example, the 1972 erosion resulted from a tangle of flotsam which lodged on the Forsyth County bank, creating a swirl of water directed against the Yadkin County side and the site. The earlier cutting was caused by the historic structure described above. Erosion in prehistoric times is evident in the excavation of Burials 3 and 5, and the varve-like wash lines exposed in Excavation Unit (E.U.) 17. Wash lines observed in E.U. 13 probably represent incremental filling of the 1916 gully. In any case it is clear that the riverine slope has been repeatedly affected by aggradation or erosion, and the backswamp slope by land leveling. The levee crest has been least influenced by these processes, and not unexpectedly yielded the bulk of intact cultural features. Figure 6 compares a profile of E.U. 17, on the riverine slope, and E.U. 24, four meters upslope near the levee top. Despite the short distance between the two pits, note the differences in stratigraphy, particularly the cutting and filling in E.U. 17.

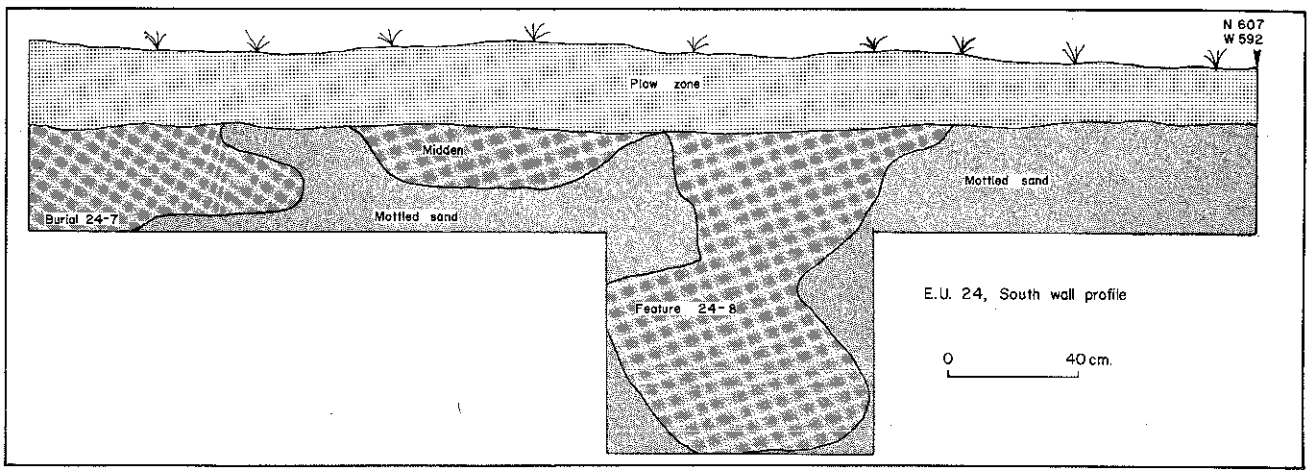
Radiocarbon Dates

Six radiocarbon samples from Donnaha have been analyzed, and these indicate the main occupation dates between A.D. 1000-1500. The archeological context of each sample is discussed in the following section, but for convenience a brief summary is here included.

Five of the samples were taken from E.U. 34, the large block opened in the summer of 1975. A sample from F.S. 34-4, directly above a lens of midden debris capping a burial, yielded a date of 910 $\pm$ 90 radiocarbon years: A.D. 1040 (Beta 3265). A nearby posthold produced the date of 2190 $\pm$ 90 radiocarbon years: 240 B.C. (Beta 3268). Both dates are discussed under F.S. 34-28. A third date of 2010 $\pm$ 120 radiocarbon years: 60 B.C. (Beta 3267) was obtained from trash pit F.S. 34-78. It is difficult to explain these two anomalous dates, particularly the 60 B.C. example which was obtained from a



a



b

Figure 6. Profiles of two 1 x 4m trenches in the E.U. 16 area, Donnaha Site (3!Yd9). Note the cutting and filling in E.U. 17 on the riverine levee slope (a) but absent in E.U. 24, only 4m upslope (b).

(seemingly) undisturbed deposit of ordinary midden refuse. These two B.C. dates may be registering a Late Archaic occupation at Donnaha which produced charcoal later to be mixed with (in the trash pit) or confused with (the posthole) the Late Woodland component. Two additional dates from E.U. 34 are less equivocal. In F.S. 34-166, a human burial, a lens of charcoal found in the grave fill gave a date of 810 ± 70 radiocarbon years: A.D. 1140 (Beta 3266). In trash pit 34-135 a sample produced the date of 470 ± 70 radiocarbon years: A.D. 1480 (Beta 3269). This sample was directly associated with the vessel fragment shown in Figure 24.

While all 5 of the E.U. 34 dates were obtained on wood charcoal, the sixth sample consisted of mussel shell from E.U. 40. The sample was obtained from the undisturbed shell midden directly below the plow zone. The date is 700 ± 70 radiocarbon years: A.D. 1250 (Beta 3264). No C-13 analysis was performed on this sample, so the date may be distorted by isotopic fractionation. If so, the analysis cited probably has yielded a too-recent date.

FEATURES

To facilitate description of the numerous features encountered at Donnaha, the following section has been arranged by excavation unit numbers. The location of the E.U.'s can be found in Fig. 3.

To prevent encumbering the Donnaha data with an additional notation system, the features will be referenced by the same numbers given in the field. These field specimen (F.S.) numbers were assigned within an E.U. to maintain the vertical and horizontal provenience of all features and their contents as well as the normal excavation levels. Hence the designation F.S. 40-10 is a burial pit observed between 71-85 cm below surface at the south end of E.U. 40--central pit coordinates are N640.60 W637.60. Occasionally a single feature was given more than one F.S. number, either to maintain finer provenience control within the feature or because portions of a single feature were discovered on either side of a baulk separating excavation teams, the unity of the feature not demonstrable until the baulk was profiled, photographed and removed.

In the following description I have supplied functional terms for certain of the features, e.g. "cache pit", "hearth", "trash pit". It is freely admitted that such labels can have an insidious influence on archeological interpretation if accepted uncritically. I can only state that the variables of pit shape, contents and association are used in assigning these terms, and it is recognized that function can change before a pit is filled and abandoned. Even if a quite symmetrical pit, such as F.S. 1-5, originally served as a cache pit, it later could have been utilized for trash disposal or even a burial. As will be clear, there are many instances at Donnaha of carefully dug pits, some quite deep, filled with ordinary midden refuse. The enigmatic nature of these and other features has prompted a graduate thesis now in progress; for now I can only warn the reader to maintain a healthy mistrust of the labels affixed here.

Excavation Unit 1

Originally a 2-meter square situated near the access road, this unit gradually was expanded throughout the 1973 season to trace features partially revealed in the original square and its extensions (Fig. 7). There is no well-defined midden stratum in this portion of the site--only slight soil discoloration with charcoal flecks, bits of bone or shell and an occasionaly artifact is observed below the plow zone and above the sterile yellow sand, the latter appearing at about 35 cm below surface. Thus the recorded features were observed either upon removal of the plow zone or with the excavation of the next 15 cm level.

F.S. 1-5 (Cache pit?)
Central coordinates: N470.20, W490.30
Depth: 31-123 cm below surface
Size, shape: 1 x 8 m, round to slightly oval.
Comments: The regular outline of this feature, including rather

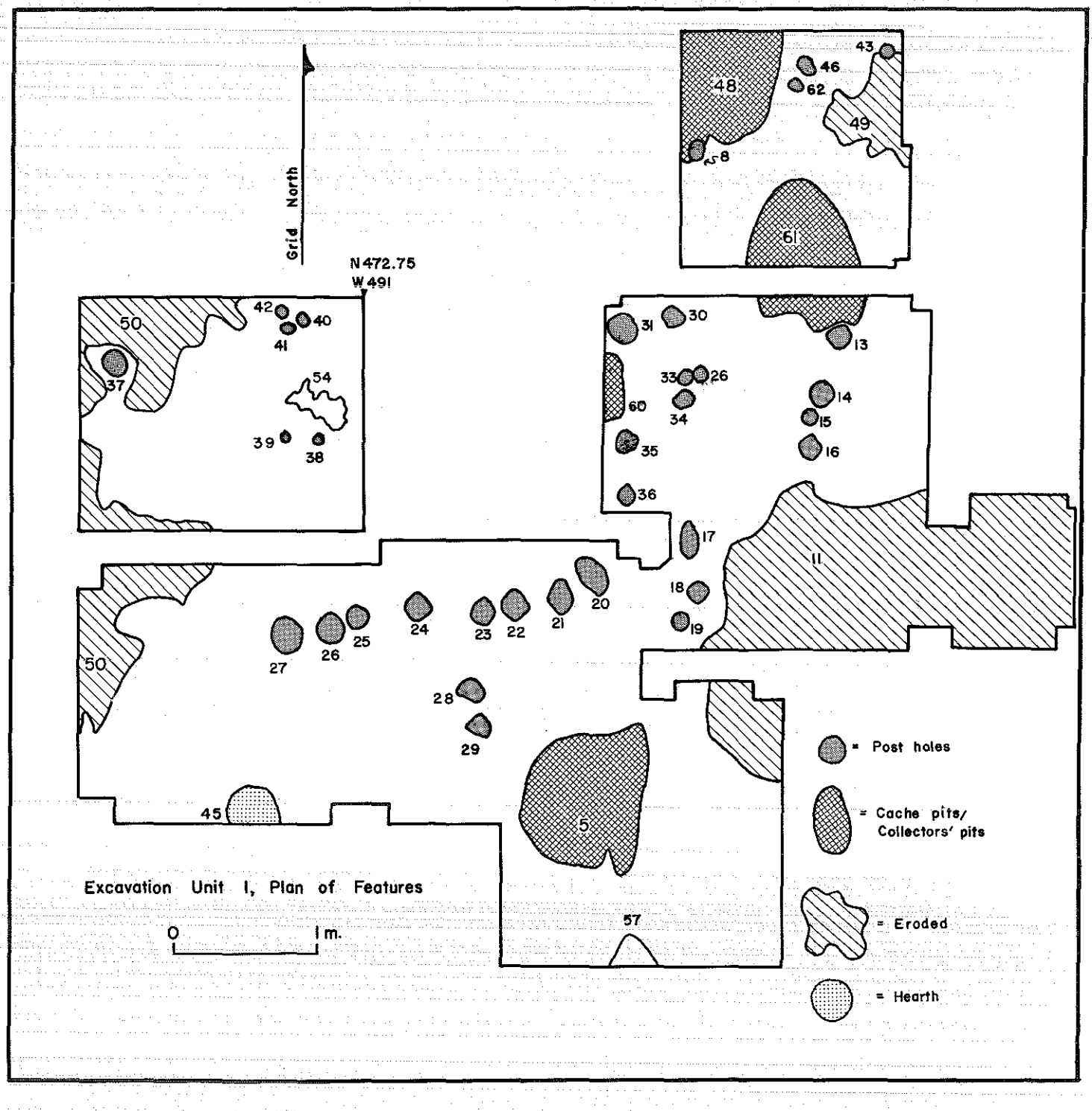


Figure 7. Plan of E.Ü. 1, Donnaha Site (31Yd9).

straight walls, and its proximity to a probable house are the only evidence for its function. Artifacts were scarce in fill.

F.S. 1-11 (Utilized erosional feature?)
Coordinates: N471.40, W468.60
Depth: 31-140 cm below surface
Size, shape: At least 2 x 2.4 m, shape unknown but probably ovate, long axis E-W.
Comments: The large size and irregular margins of this pit suggest it may be an old gully that filled during the site occupation. A cross-section shows several lenses of variegated soil, ash and charcoal fingering inward and downward from the edges; artifacts were not abundant.

F.S. 1-50 (Utilized erosional feature)
Coordinates: N473.6, W493.0
Depth: 40-103 cm below surface
Size, shape: Size unknown but at least .9 x 3 m. Shape is irregular.
Comments: This is a large sprawling stain only partially uncovered by E.U. 1. The sloping sides and uneven floor and edges suggest a depression formed by erosion; abundant artifacts, firecracked rock and lenses of charcoal indicate it was filling during the site occupation.

F.S. 1-48 (Cache pit?)
Coordinates: N475.60, W489.70
Depth: 41-103 cm below surface
Size, shape: Probably a circular pit approximately 2 m in diameter--only partially exposed and excavated.
Comments: This pit was very symmetrical with nearly straight sides and a rounded bottom. Charcoal flecks and lenses were present, although artifacts were not abundant. No traces of a lining were found, but the regular shape suggests this feature was a storage pit also used as a trash repository. A posthole with postmold is intrusive in the southern edge.

F.S. 1-49 (Erosional feature)
Coordinates: N475.0, W488.2
Depth: 30-95 cm below surface
Size, shape: Size unknown, but at least 50 x 70 cm. Shape is very irregular.
Comments: The edges, sides and bottom of this stain were not clearly delineated and artifacts were scarce. It probably is a small erosional feature filled by downslope wash. An intrusive posthole on the northern edge indicates the feature is contemporary with the site occupation.

F.S. 1-61 (Collector's pit?)
Coordinates: N474.0, W488.90
Depth: 31-109 cm below surface
Size, shape: .8 x 1 m, oval

Comments: This pit was well-defined and symmetrical, but produced few artifacts and no soil or charcoal lenses. It interrupts a sequence of postholes extending across the E.U., and may be of recent origin--possibly a relic collector's pit.

F.S. 1-45 (Hearth)
Coordinates: N470.1, W492.75
Depth: 35-38 cm below surface
Size, shape: Circular basin 35 cm in diameter.
Comments: The gray soil which filled this shallow pit was a consequence of fine ash mixed with sand. The ash was concentrated in lenses, in places with charcoal fragments. At least one of the 10 flakes included in the fill has been burned. The hearth is unlined, and the sand matrix surrounding it shows no evidence of intense or prolonged burning. Presumably only one or a few fires were built in a scooped-out depression.

F.S. 1-57 (Cache pit?)
Coordinates: N469, W490.5
Depth: 30-110 cm below surface
Size, shape: Both unknown, but the portion exposed suggests a round to oval pit at least 35 cm in diameter. Sides are straight, the bottom slightly rounded.
Comments: Only part of this feature was exposed, and the function is suggested only by the symmetry of this excavated section. The slightly mottled fill was almost sterile.

F.S. 1-54
Coordinates: N492.90, W472.30
Depth: Unknown
Size, shape: 20 x 45 cm, an irregular shape
Comments: This stained area was not excavated. Its irregular shape and ambiguous edges suggest a tree root stain.

F.S. 1-60 (Cache pit?)
Coordinates: N473, W490.20
Depth: Unknown
Size, shape: Unknown, but probably round to ovate ca. 50 cm in diameter
Comments: Only the eastern edge of this pit was revealed in our excavations, and its fill was not removed. Its location within a presumed structure, coupled with the symmetry of its edge, suggest a storage pit is represented.

F.S. 1-8, 1-13 through 1-43, 1-46, 1-62 (postholes)
Coordinates: See Fig. 7
Depth: Range 34-99 cm below surface, 101.28 - 100.69 m above datum.
Size, shape: Circular to ovate, maximum diameter 30 cm, minimum 7 cm.
Comments: Portions of an oval structure appear to be represented by some of these postmolds, namely F.S.'s 13-27 and 8. The remainder may be interior (nos. 30-36) or exterior (28, 29, 46, 62) facilities. Unfortunately time did not allow complete exploration of

the E.U. 1 complex, and erosion and/or several aboriginal pits have obliterated sections of the anticipated wall post alignments. Based on the evidence at hand, the structure in E.U. 1 measured at least 4 meters along one dimension (east-west). Using only the presumed wall posts as the data set (n=16), the depth of the bottom of the post holes below surface has a standard deviation of 15.2 cm; by disregarding two outliers--F.S. 8 and 27--the standard deviation is reduced to 10.18 cm. These figures are based on below surface measurements which are, of course, affected by present site topography. Using absolute rather than relative measurements (the meters above datum record), the standard deviation (n=16) is reduced to 12 cm, and omission of only one outlier (F.S. 27) gives a standard deviation 8 cm. The consistency of these post hole depths suggest that F.S. 13-27 and 8 probably were results of a single building constructed on a surface more level than at present.

Close examination of the E.U. 1 profiles produced no evidence of a living floor inside the structure, and it is likely that the ground surface has eroded or been plowed below the old floor level. This is supported also by comparing the absolute post hole depths to those discovered in E.U. 34, located 140 meters to the north-northwest near the levee crest, in the midden area. The present surface in the E.U. 34 area is about 1 meter above that of E.U. 1, but the bottoms of the post holes are about the same height above datum. Unless the E.U. 1 posts were buried much more shallowly than in 34, then the surface has been severly eroded. Erosion in this area is supported by accounts of the 1916 flood's effects in the E.U. 1 area, and it is likely that the surface scatter of materials extending downstream over 300 meters beyond E.U. 1 is a result of floodwater transport of debris from a midden once present near the access road, in the E.U. 1 location.

Excavation Unit 2

This E.U. consisted of a single 2-meter square excavated to 1.23 m below surface. Two poorly defined discolorations were observed below the plow zone, but excavation showed both likely to be of natural origin. One is a tree root stain, the other a minor, irregular depression in the yellow sterile subsoil which filled with the mottled overlying stratum. This E.U. produced very few artifacts, and none were recorded from the stains.

Excavation Unit 3

Originally a 2-meter square, E.U. 3 was expanded to form a 2x4 m trench to expose the single feature discovered.

F.S. 3-4 (Cache pit)
Coordinates: N462, W501
Depth: 33-90 cm below surface
Size, shape: Oval, with slightly irregular margins, 1.1 x 2 m at 33 cm below surface. Pit is basin-shaped in cross-section with sloping walls and a slightly rounded bottom.
Comments: This pit penetrated well into the sterile sand stratum and

was filled with lightly stained sand, artifacts and an occasional charcoal lens. Its most likely explanation is a cache pit with collapsed walls which was then utilized as a refuse repository.

Excavation Unit 4

This unit revealed only one soil anomaly, the result of a decayed tree root system.

Excavation Unit 5

Begun as a 2-meter square, this unit was expanded south to a 2 x 4 m trench in order to expose the single feature encountered.

F.S. 5-3 (Cache pit?)
Coordinates: N500, W501.2
Depth: 30-117 cm below surface
Size, shape: 60 x 80 cm, oval in plan with nearly straight sides and a gently rounded bottom.
Comments: This pit is well-defined and symmetrical, penetrating 65 cm into sterile yellow sand. The interior of the cache pit show two strata, an outer layer of mottled yellow-brown sand and an inner stratum of very dark brown sandy loam, giving the impression of a pit within a pit. This stratigraphy is consistant with a pit which partially filled naturally with the resultant interior depression used as a trash repository. Artifacts were more abundant in the interior fill, particularly large pieces of fire-cracked quartzite.

Excavation Unit 6

This 2- meter square produced no cultural features.

Excavation Unit 7

This 2-meter square was one of the "random sampling pits", located in the southeastern margin of the site. All artifacts occurred in the plow zone, and no features were present.

Excavation Units 8, 9

These units, also part of the random sample design, are at the extreme southeastern edge of the site. Despite occasionaly surface finds in this area, both units were devoid of artifacts and features.

Excavation Unit 10

Another of the random sampling squares, E.U. 10 is located near the Yadkin River south of the access road. Stratigraphy of the walls showed a series of variously colored sands and a clay lens resting on a stratum of red clay at 45 cm below surface. Clearly this area has been cut and filled by the river, and no features are present.

Excavation Unit 11

This random sampling square is just south of the access road, again near the river. As in E.U. 10 the stratigraphy show severe erosion and infilling, producing--at 60 cm below surface--flakes, a gunflint and a .22 shell case. No features are present.

Excavation Unit 12

This square, one of the randomly placed test pits, is situated 140 meters south of the access road and 100 m from the river. It was sterile below the plow zone, and no features were present.

Excavation Unit 13

Begun as a 2-meter random square, and later expanded by a second square adjacent on the north side, this unit produced the most perplexing feature of the 1973 season.

F.S. 13-4 (Eroded burial)
Depth: 21-210 cm below surface
Coordinates: N514.3, W453
Size, shape: Size unknown, but at least 2 x 3.4 m; shape is irregular on the exposed edges, with sides sloping steeply to a slightly rounded bottom.
Comments: A cross-section of this feature revealed stratigraphy commensurate with a filled erosional feature. Strata of clay, mottled sand and clean river sand are overlain by darker midden-stained soil, all sloping downward into the feature. Near the base of the mottled sand were found several human skeletal fragments. Artifacts were abundant, including potsherds which restore about a third of one large net-impressed vessel and a smaller portion of a second (Fig. 26). This feature is interpreted as an adult burial which was largely destroyed by erosion, probably in 1916 when this portion of the site was badly damaged. The vessel portions may represent grave goods but there is no parallel for such inclusions from our excavations.

Excavation Unit 14

This E.U. consisted of a single 2 m square, randomly placed and located on the backswamp slope of the levee. Apart from the "double plow zone" described in the Stratigraphy section, no features were found. This unit was excavated into sterile soil, terminating at 110 cm below surface.

Excavation Unit 15

Like E.U. 14, this 2-meter square showed a plow midden capped with near-sterile alluvium, and above this present plow zone. Only one feature was defined.

F.S. 15-10 (Dog burial)
Depth: ca. 52-106 cm below surface
Coordinates: N458.2, W631.8
Size, shape: The burial pit walls are straight, the floor flat, and the feature measures 51 cm in diameter. The pit appears to have been a simple round hole originating in the dark midden--its top could not be confidently detected because of the homogeneity of the pit fill and its midden matrix, but it is certainly present at 52 cm below surface.
Comments: The bones are friable and highly fragmentary, but all portions of the body are represented. Comparisons with skeletal dogs of known size indicate this Donnaha specimen was about 40 cm tall at the shoulder. The dog probably gave long and faithful service--molars and pre-molars are rounded and worn, with one abscessed. Interestingly several of the fragments show damage by rodent gnawing, never observed on the human skeletal remains.

Excavation Unit 16 Area

Excavation Unit 16 was the first of several trenches excavated in the dark midden soil on the crest and riverine slope of the levee. Several E.U. numbers ultimately were assigned as the original trench was expanded (Fig. 8), but for present descriptive purposes this area will be treated as a single unit. As mentioned in the Stratigraphy section, the E.U. 16 excavations were in the deepest part of the site midden; the dark sandy loam extended 40 cm or more below the plow zone. Pits excavated into the midden and below it often were not recognized as features upon removal of the plow zone because the pit, itself filled with midden soil, was not detected until it was outlined against the light yellow sand below the midden. The exception was the burial pits, which were refilled promptly and thus incorporated the lower lighter soil in the upper portions of their fill, making them stand out more readily.

F.S. 16-5 (Trash Pit)
Depth: 75-104 cm below surface
Coordinates: N605.70, W594.70
Size, shape: ca. 80 x. 120 cm, oval in plan with straight walls and a slightly rounded bottom.
Comments: Artifacts and midden debris--bone, shell, charcoal--were abundant in this pit. It was intrusive upon feature 16-6, a burial.

F.S. 16-7 (Trash Pit)
Depth: 75-98 cm below surface
Coordinates: N607.5, W592.70
Size, shape: Minimally 70 x 100 cm. The complete outline of this pit was not uncovered, and the eastern side was obliterated by an intrusive feature, F.S. 16-8. There is evidence that F.S. 16-7 was intrusive upon a third pit (see Comments, F.S. 16-9). Intact pit edges are slightly irregular, but an oval plan is suggested. Walls were sloping, and the bottom was rounded and uneven.
Comments: Artifacts and midden debris were abundant in the pit fill.

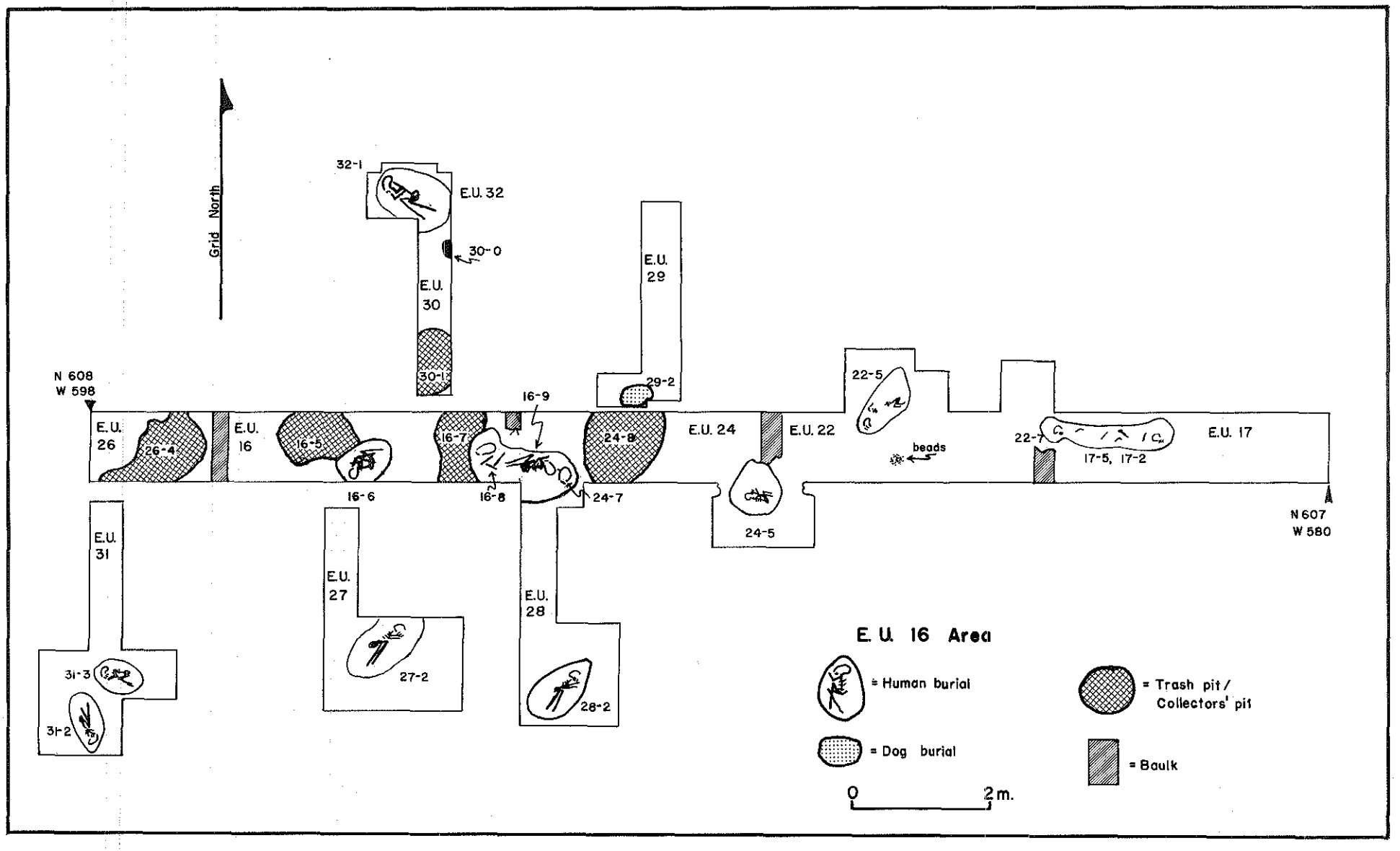


Figure 8. Plan of E.U. 16 area, Donnaha Site (31Yd9).

F.S. 26-4 (Trash Pit)
Depth: 52-108 cm below surface
Coordinates: N607.5, W597
Size, shape: Round to oval (see below), 90 x 130 cm, walls straight to sloping, bottom rounded.
Comments: This feature represents two intersecting pits, and the intersected portions of neither could be defined. The larger pit is roughly circular and has its bottom at 75 cm below surface, with straight walls and a slightly rounded bottom. On its southern side this pit intercepted, or (less likely) was intercepted by a small, probably oval pit with gently sloping walls and rounded bottom which extended to 108 cm below surface. This small pit was not completely exposed by our excavations, but its size can be estimated because it did not appear in an adjacent E.U. (31) separated from E.U. 26 by a 30 cm baulk. In any case the fill of both was comprised of midden debris and abundant artifacts, including most of a vessel recovered from the deeper pit.

F.S. 24-8 (Collector's pit)
Depth: 25-121 cm below surface
Coordinates: N607.5, W590.3
Size, shape: As exposed, the pit measures 1.1 x 1 m, but it continues into both sides of the 1 m trench. The outline is oval in flat plan, and in cross-section the walls are steeply in-sloping then bell out and into a flat bottom (Fig. 6b).
Comments: Artifacts were frequent in the pit fill, along with mussel shell and animal bone, but the frequency was approximately the same as the overlying midden. Two small pieces of human bone were found, suggesting this feature may be a hole dug by a relic hunter who found and looted a human skeleton.

F.S. 30-1 (Trash Pit)
Depth: 33-103 cm below surface
Coordinates: N608.7, W593
Size, shape: 1 m north-south and at least 50 cm east-west. The pit was not fully exposed on its eastern and western sides, but it appears to be circular in flat plan. Walls were straight to slightly sloping, the bottom rounded.
Comments: Artifacts were especially abundant in the fill of this feature, particularly potsherds and animal bone.

F.S. 30-0 (Posthole)
Depth: 33 cm -
Coordinates: N610.4, W592.8
Size, shape: 20 cm in diameter, circular.
Comments: This feature was partially exposed but not excavated. In profile it was vertical from the bottom of the plow zone to the trench floor, 45 cm below surface.

F.S. 29-2 (Dog Burial)
Depth: 38-45 cm below surface
Coordinates: N608.30, W590.30
Size, shape: Circular in flat plan with sloping walls and a slightly rounded bottom; at 38 cm below surface the feature is 45 cm in diameter.
Comments: This dog, almost identical in size to the F.S. 15-10 specimen was buried on its left side with the head to the east. At some time after decay of the flesh and ligaments an intrusive pit--F.S. 25-8--severed the skeleton behind the sixth thoracic vertebra and removed the entire frontal portion including scapulae, all bones of the forelegs and, of course, the skull. All epiphyses are fused, and the first and second lumbar vertebrae are united by a large callous formed on their ventral side, a consequence of ossifying spondylitis which likely produced some degree of paresis in the rear legs.

Seven caudal vertebrae were recovered, and when reassembled these show a pronounced upward and forward curve. Lipping is observed on their articular surfaces, and one has a callous formed over its dorsal processes. Apparently this creature was a well-scarred veteran of the chase.

F.S. 16-6 (Human Burial)
Depth: 60-104 cm below surface
Coordinates: N607, W594
Size, shape: 50-80 cm, oval in flat plan. The unlined burial pit has nearly straight walls and a flat bottom.
Comments: The skeleton was tightly flexed, with the hands on the left shoulder, the skull to the southwest. No burial furniture or body/clothing ornaments were present. Like most intact burials discovered at Donnaha, the extreme flexure of the lower limbs and the juxtaposition of the knee joint and thoracic bones strongly suggest the body was bound before burial.

F.S. 16-8, 16-9, 24-7 (Human Burials)
Depth: 52-86 cm below surface
Coordinates: N602.2, W592
Size, shape: 80 x 160 cm, roughly oval in plan. Pit walls are nearly vertical, the pit bottom flat.
Comments: Three individuals are represented in this sprawling feature, the result of prehistoric excavation and re-excavation of earlier burials. Only one skeleton was articulated, found in the central portion of the feature, fully flexed, with the head to the east facing north (F.S. 16-9). In the western third of the stain (i.e., that portion seen in the eastern end of E.U. 16) was found a calvarium and disarticulated long bones, all fragmentary (F.S. 16-8). On the eastern edge of the feature is another skull (F.S. 24-7), this largely complete but friable; the later central burial overlapped the lower portion of this skeleton and partially disturbed it, but because the final burial was a few centimeters higher the original position could be defined: fully flexed, on its side with the head to the east and facing south. Perhaps as a result of the

disturbance and damage, these bones were in poor condition and could not be recovered intact.

Apparently the original burial was the westernmost remains, later disturbed by excavation of a trash pit (F.S. 16-7). Then the easternmost burial was made, which in turn was disturbed by the final interment, the central (articulated) individual.

F.S. 24-5 (Human Burial)
Depth: 40-60 cm below surface
Coordinates: N607, W588.3
Size, shape: 80 cm in diameter in flat plan, circular in shape with straight walls and flat floor.
Comments: The skeleton is resting on its back, flexed with the right arm folded to place the hand on the right shoulder; the left hand rests on the pelvic area. The skull is to the west, and legs folded to the left side. This individual probably was not bound prior to interment.

No burial furniture was present, but 248 Marginella beads, arranged in four strands, encircled the throat area. These shells are unworked except for a single hole for stringing. One strand, the lowest, had beads threaded to reach from ear to ear, while the upper three strands had beads threaded under the mandible. Apparently these were worn close to the throat, a "choker" necklace.

F.S. 22-5 (Disturbed Human Burials)
Depth: 25-40 cm below surface
Coordinates: N608, W586.5
Size, shape: Remains scattered within an oval area 50 x 110 cm--see Comments below.
Comments: At least two burials are represented by this badly disturbed feature(s). One, a child, was present at 40 cm below surface and consists of the articulated lower portion of the skeleton and most of a cranium moved by erosion. Wash lines above and around this burial indicate that overbank flooding by the river cut into the burial, dislodging the skull and removing some bones of the torso and upper limbs. Judging by the positioning of the flexed legs, the head probably lay to the south.

The second burial is immediately to the west and slightly higher, in the plow zone, where it has been disturbed by cultivation. The scattered bones indicate an adult, but the cranium is not present. A portion of a mandible and six (permanent) teeth were found 60 cm to the south at the same elevation, however, associated with a 5-strand bone and shell bead necklace, and likely once was associated with the adult postcranial remains.

This necklace-teeth association is of interest because it indicates that burials were disturbed by erosion during, or immediately following, the site occupation. The beads, 288 in number, were individually mapped to show a pattern which allowed the five strands to be reconstructed. The pattern is U-shaped with the teeth and badly decayed mandibular fragment in the open end, and both teeth and beads rested in an undisturbed sand stratum with wash lines. It

would seem that shortly after this person was interred--before the threads of the necklace had decayed--gentle erosion exposed then reburied the remains. This erosion probably caused most of the remains to be left slightly more shallow where they were later scattered by plowing, while the mandible and beads were preserved just below the plow zone.

F.S. 17-5, 17-2, 22-7 (Disturbed Human Burials)
Depth: 35-66 cm below surface
Coordinates: N607, W583
Size, shape: Approximately 1 x 2 m, irregular in shape. No pit is present.
Comments: The entire western end of E.U. 17 has been drastically affected by erosion and subsequent filling, and it was in an old gully that the skeletal fragments of at least three individuals were found. The remains were scattered and broken within the stratum of alluvial gravels and sand (Fig. 6a), along with abundant midden debris and two historic items, a cut copper nail and a wire nail. The wire nail was found well below the skeletal remains, suggesting the erosion and filling evident in the profiles (and consequent destruction of the burials) occurred in this century, probably in 1916 or 1940. Although this concentration of human bone is not a cultural feature sensu stricto it is included here for continuity.

F.S. 31-3 (Human Burial)
Depth: 68-90 cm below surface
Coordinates: N604.20, W597.5
Size, shape: 50 x 80 cm in flat plan, oval in shape. The burial pit walls are nearly vertical, the pit bottom flat.
Comments: This badly decomposed burial was positioned in a tightly flexed position, resting on its right side with the skull to the west. The arms were bent to place the hands at the face. Bones of the left leg and the entire left half of the pelvis were not found; a triangular projectile point was found in the pelvic area, but this may be a fortuitous association.

F.S. 31-2 (Human Burial)
Depth: 66-86 cm below surface
Coordinates: N603.3, W598
Size, shape: 50 x 80 cm in flat plan, oval in shape. Burial pit walls were straight, with a flat floor.
Comments: This burial was tightly flexed, resting on its right side with arms bent to position the hands under the chin. The skull was to the south.

F.S. 27-2 (Human Burial)
Depth: 42-107 cm below surface
Coordinates: N604.7, W593.5
Size, shape: 70 x 130 cm, oval in flat plan. The pit walls are straight and the floor slightly dished.
Comments: This burial lay on its back, knees drawn up to the chest and

the feet crossed. The arms were bent and crossed so that the right hand rested on the left shoulder, the left hand on the right breast. The skull was to the northeast. Two concentrations of pierced Marginella shells were present, one adjacent to the left femoral shaft and the other in the crook of the left arm. These concentrations (including complete and fragmentary specimens) total 190, and some 100 additional examples were found scattered below the skeleton in no recognizable pattern. Below the shell concentration, and extending underneath the skeleton was a very thin dark stain, possibly left by clothing or a shroud.

F.S. 28-2 (Human Burial)
Depth: 80-97 cm below surface
Coordinates: N604, W591
Size, shape: 60 x 100 cm in flat plan, oval in shape. The pit walls are straight and the floor is flat.
Comments: The skeleton is lying on its right side with the skull to the northeast. The arms are flexed to place the hands at the chin, and the legs are tightly folded to the chest.

F.S. 32-1 (Human Burial)
Depth: 36-67 cm below surface
Coordinates: N611, W593.2
Size, shape: 80 x 110 cm, oval in flat plan. Pit walls are straight and the pit floor is slightly basin-shaped, almost flat.
Comments: The skeleton is lying on its back with the skull to the northwest. The legs are tightly flexed; the right arm is bent to place the hand on the abdomen, while the left arm is slightly bent with the hand in the pelvic region. Extending beneath, around and over the entire skeleton were 720 pierced Marginella shells. The distribution of these conforms to the outline of the skeleton itself rather than the pit, so these shells almost certainly were sewn to clothing or a burial shroud. In addition to these, a single strand of 238 flat shell beads encircled the neck, resting just below the mandible in a "choker" style.

Excavation Unit 18

This 2 meter unit is one of the "random square" sequence, and was located in the southwestern portion of the site. The plow zone is in light tan sand, 34 cm thick, overlying a very dark midden stratum 18-22 cm thick. This midden soil grades into a lighter brown sand with less cultural debris, which rests on sterile yellow-brown sand at 70 cm below surface.

F.S. 18-7 (postholes)
Depth: 60-84 cm below surface
Coordinates: N609.7, W680; N609.75, W681.75
Size, shape: 40 cm in diameter, circular with straight sides and a rounded bottom.
Comments: These dark stains contained bits of charcoal and an

occasional potsherd. Time did not allow this unit to be expanded to locate additional structural remains.

F.S. 18-9 (Trash Pit)
Depth: 60-98 cm below surface
Size, shape: At least 45 x 140 cm in flat plan. Only partially exposed by our work, this pit probably is oval or circular. The walls are straight and the bottom is rounded.
Comments: This pit contained an abundance of mussel and snail shells and animal bone, along with cultural debris such as broken or aborted projectile points, sherds, and debitage.

Excavation Unit 19

This unit was randomly placed, and was located on the backswamp side of the levee south of the midden-stained portion of the site. It produced no features.

Excavation Unit 20

Still another random unit, this square was excavated on the backswamp levee slope south of the midden area. The stratigraphy shows a recent plow zone 30 cm thick resting on a thin (3-8 cm) stratum of alluvium, which is underlain by 25 cm of midden-stained sand. This midden stratum also has been plowed but not as deeply as the upper zone, probably reflecting the use of draft animals (see Stratigraphy section). Below the midden is lightly mottled brown sand, and this stratum yielded the only feature.

F.S. 20-5 (Pit)
Depth: 78 cm - 108 cm below surface
Coordinates: N501.8, W572
Size, shape: Probably circular (only partially exposed), and basin-shaped in cross-section with gently sloping walls and a rounded bottom. Estimated diameter at 78 cm below surface (the top of the feature) is 150 cm.
Comments: This feature appeared as a faint stain in the northeast corner of the square; the southwestern quadrant of what appears to be a circular pit was thus exposed and excavated. Only two small sherds were found in the fill.

Excavation Unit 21 Area

A total of three excavation units is included in this discussion, all clustered on the south-central portion of the site. The stratigraphy here--on the backswamp levee slope--is similar to that of E.U.'s 18-20, namely a modern plow zone overlying a 25 cm-thick layer of nearly sterile laminated sands. These sands rest directly on 35 cm of midden-stained sandy loam, which gives way to sterile sand at about 90 cm below surface. When the midden stratum was exposed, light colored parallel striations were clearly present on its surface, the result of plow furrowing. As will be seen, interpretation of the feature discovered by the E.U. 21 trenches was greatly complicated by the presence of these furrows.

F.S. 21-2, 25-3 (Stockade Trench?)
Depth: 55-58 cm below surface
Coordinates: N485.7, W579 to N580, W574.20
Size, shape: 8 m in length, ca. 50 cm in width, with the long axis northwest-southwest.
Comments: This feature was observed as a series of waterlaid clay lenses, some circular and about 20 cm in diameter, the others of irregular shape and larger but oriented along the same NW-SE line. The lenses are quite thin, usually 1-3 cm, at the same depth, and contain no artifacts. The clays must have been deposited by standing or very slow-moving waters in a linear depression. If this depression is of aboriginal origin (its straightness and orientation, paralleling the levee on the backswamp slope, strongly suggest it is not a natural feature) then the following events are indicated:

First a trench was excavated and posts set at about 25 cm intervals. The soil at the base of the trench was compacted, and later at least some of the posts were removed. Runoff water occasionally filled the trench floor to a depth of 20-30 cm, and in historic times this soil was plowed, the tip of the plow grazing the top of the clays. Still later (1916? 1940?) swift flood waters scoured this area, removing soil down to the level of the clay lenses and then burying them beneath the laminated sands seen in the profile. Finally, additional soil moved from upslope to bury the sand stratum, and the modern plow zone formed at this uppermost level. Torturous as this explanation is, it is the only way to explain the bottom of the trench at the same level as the bottom of the plow furrows, both overlain by the coarse sands and the second (later) plow zone.

The function of the trench is not clear, but it may represent a palisade around the Donnaha village.

Excavation Unit 34

This unit began as a 1 x 4 m trench, but ultimately was expanded to expose a roughly rectangular area 6 x 11 m (Fig. 9). The entire unit was situated near the levee crest, and the stratigraphy indicates minimal disturbance by the river. The plow zone is about 30 cm thick, underlain by the very dark sand of the midden. Here this midden soil is from 35 cm to 60 cm thick, resting on light yellow or tan sterile sand. As in other units excavated in the vicinity, features usually could be recognized only below the midden as intrusions into the much lighter sterile matrix.

F.S. 34-28 (Human Burial and Associated Structure)
Depth: 60-103 cm below surface
Coordinates: N579.4, W588.9
Size, shape: The burial pit is oval in flat plan, 55 x 80 cm. The walls are slightly sloped and the floor is flat. The structure surrounding this pit is circular, 1.5 meters in diameter.
Comments: Examination of the soil profile across this feature revealed a thin concentration of fractured river cobbles, animal bone and

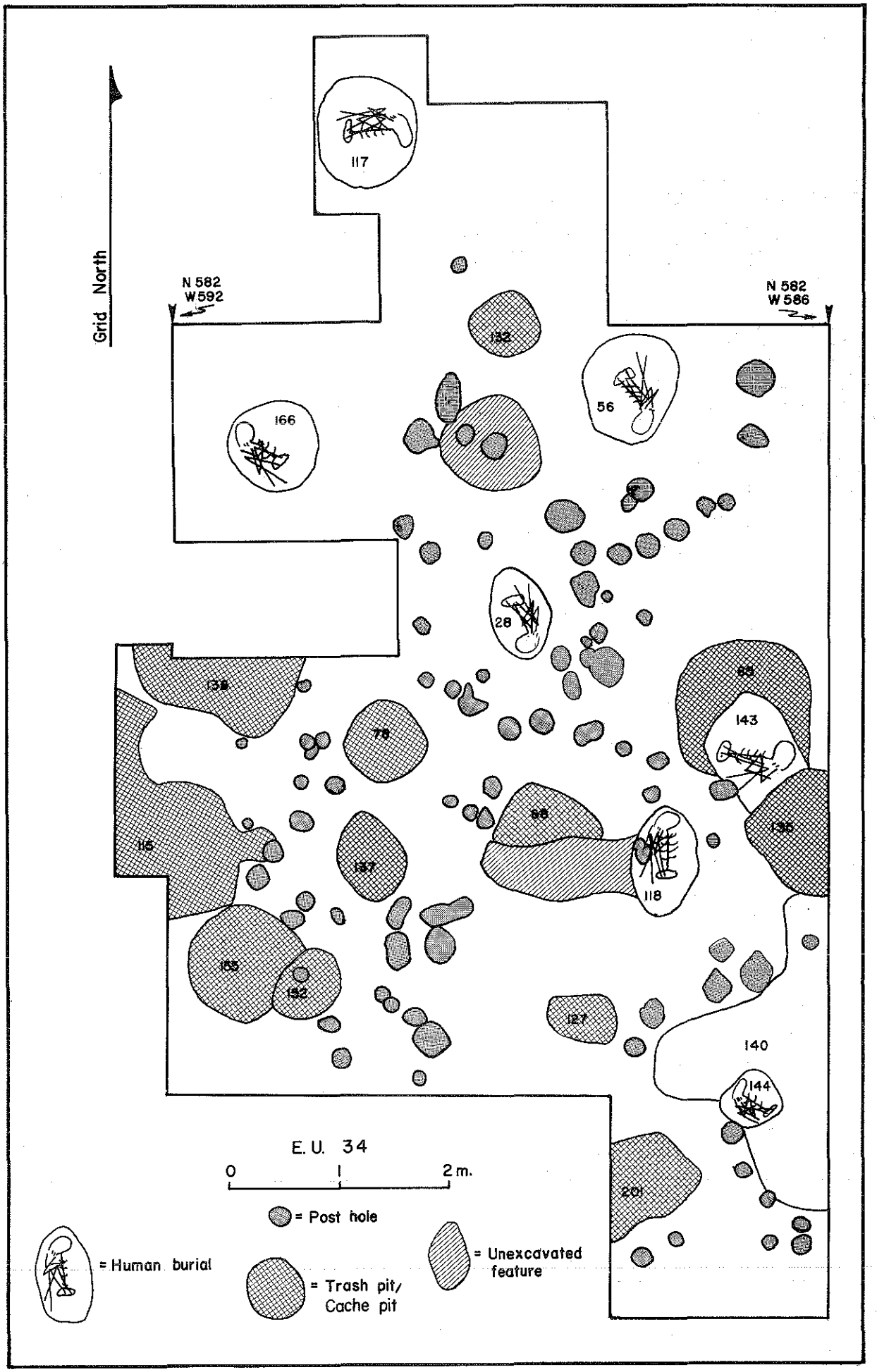


Figure 9. Plan of E.U. 34, Donnaha Site (31Yd9).

shell at 60 cm below surface. This concentration occurs only within the circle of postholes, and is interpreted as floor trash. The concentration is interrupted directly above the burial, but a thin layer of charcoal flecks--again confined to the interior of the posthole circle--occurs directly above the floor trash and the burial pit. Because of the floor trash lens it appears that the structure, small as it is, was in use prior to the burial; the burial was made 35 cm below the floor and the structure then burned.

The skeleton is on its back, very tightly flexed (Fig. 10). The legs were bent placing the knees near the shoulders and the feet crossed at the pelvis. The right arm rests across the abdomen and the left arm is bent back to position the hand at the left shoulder. The head is to the south. No grave goods or ornaments were present.

A C-14 sample from one of the postholes yielded the anomalous radiocarbon age of 2190 ± 90 years: 240 B.C. (Beta 3268), while the charcoal directly above the living floor produced a date of 910 ± 90 radiocarbon years: A.D. 1040 (Beta 3265).

F.S. 34-56 (Human Burial and Associated Structure)
Depth: 84-127 cm below surface
Coordinates: N581.4, W587.8
Size, shape: The burial pit is ovate in flat plan, 75 x 80 cm. The walls are straight except behind the skull, where the pit side was slightly undercut to accomodate the head. The floor is flat. The structure surrounding this burial was not fully exposed, but almost certainly was round with a diameter of 2.10 m.
Comments: Within the postmold arc, 35-40 cm below surface, a hard-packed surface with high clay content was observed in the profile. This surface was interrupted directly above the burial pit, and thus the packed area probably represents a house floor with the burial made in its center. No burial pit outline could be discerned at the floor level, but if the broken floor is a consequence of the interment then this burial's depth would be 35-127 cm below surface.

One item was associated with the burial, an oval marine shell gorget with two suspension holes (Fig. 17a). This was present beneath the chin, concave side out. The burial was on its back, flexed with the head to the southeast. The right arm lay on the abdomen; the left arm was folded back to place the hand on the left shoulder. The legs were bent back and to the left, placing the knees on and to the left of the chest.

F.S. 34-117 (Human Burial)
Depth: 85-192 cm below surface
Coordinates: N583.8, W590.2
Size, shape: The burial pit is perfectly circular, 1 m in diameter. The walls are vertical and the floor is flat.
Comments: The well-preserved skeleton was found lying on its right side with the skull to the east. The body was flexed in a fetal position, legs drawn up near the chest and arms bent so as to clasp the hands between the knees. The head and neck were bowed, the face toward the

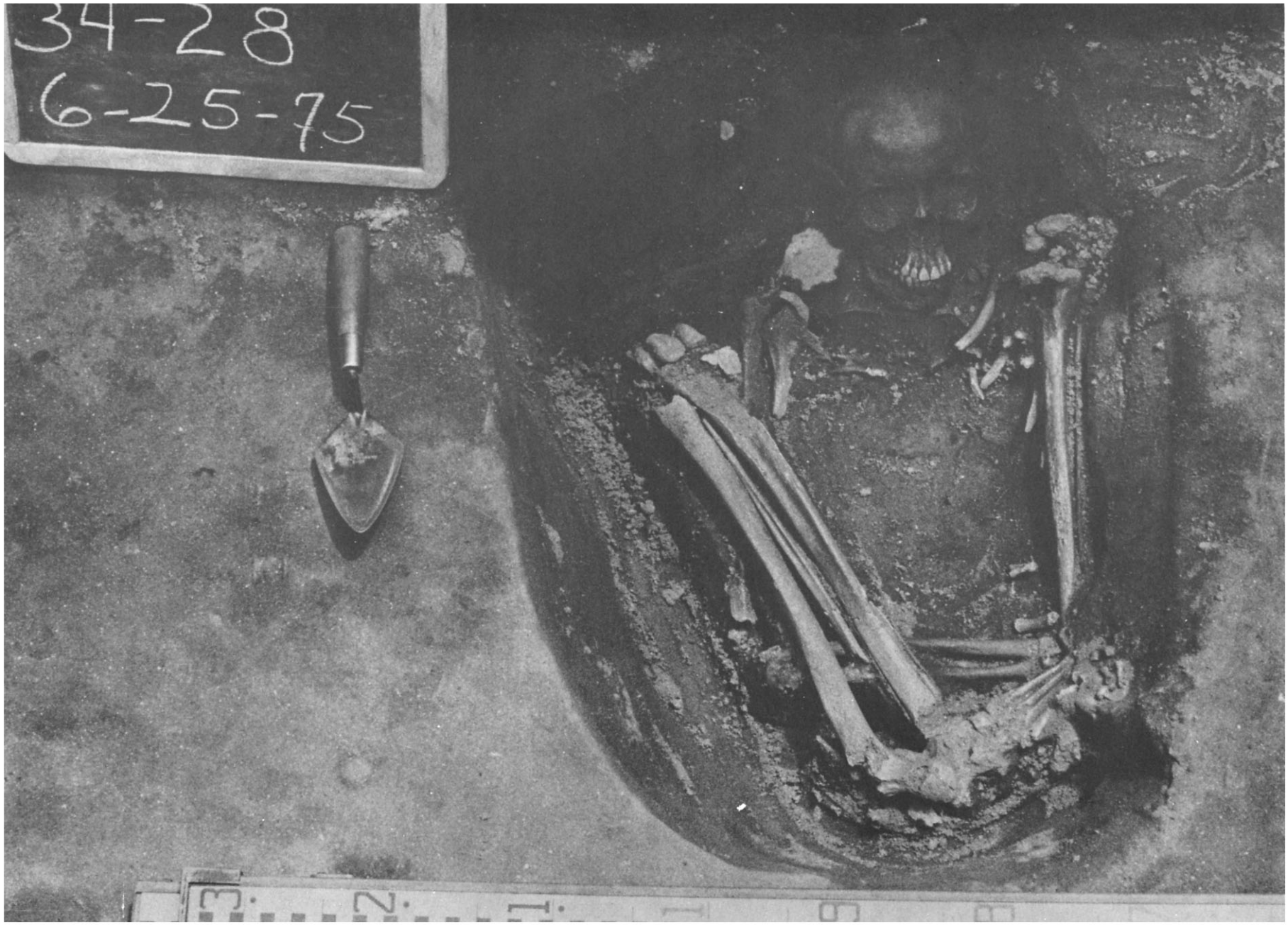


Figure 10. Burial 34-28, Donnaha Site (31Yd9).

knees. Eighteen shell beads were clustered at the center of the right tibia.

F.S. 34-118 (Human Burial and Associated ? Structure)
Depth: 89-109 cm below surface
Coordinates: N577, W587.5
Size, shape: The burial pit is oval, 60 x 100 cm, with straight side and a flat floor. The possible structure surrounding the pit, circular in plan, is 2.2 m in diameter.
Comments: A profile across this burial was carefully studied to try and detect a pit outline above the sterile matrix, but none could be seen above 89 cm, the bottom of the midden stratum. The skeleton lay on its back, the skull to the north, with the legs flexed to the right side. The arms were bent to place both hands on the right shoulder. Resting high on the chest, just below the chin, was a larged carved marine-shell gorget, concave side facing out (Fig. 11 and Fig. 17b).

A series of postholes surrounds the burial, but no floor could be detected. The burial is not in the center of the posthole pattern as is the case with F.S. 34-28 and F.S. 34-56, but rather on its northeastern edge, and the relationship between the interment and the structure is unclear. One posthole is intrusive into the burial pit, but is not part of the structure pattern.

F.S. 34-143 (Human Burial)
Depth: 125-157 cm below surface
Coordinates: N578.2, W586.7
Size, shape: The burial pit probably was once oval, but has been truncated by a trash pit on its southeastern edge. The pit measures 70 x 90 cm, with straight walls and a flat floor.
Comments: The burial pit was dug into and slightly deeper than an older trash pit (F.S. 34-85), and later was intersected by another trash, pit, F.S. 34-135, which yielded a C-14 date of 470 $\pm$ 70 radiocarbon years: A.D. 1480 (Beta 3269).

The skeleton lay on its left side with the skull to the east. The legs were tightly flexed, drawn to the chest, and the arms bent to place the left hand under the skull, the right hand in front of the face. The only artifact in association is an eyed bone pin found 3 cm below the right mastoid process oriented with the point dorsal (Fig. 12). It seems likely that the pin was worn through the ear lobe. A second, nearly identical specimen was recovered from fill surrounding the skeleton (Fig. 20 j,k).

F.S. 34-144 (Human Burial and Associated ? Structure)
Depth: 97-125 cm below surface
Coordinates: N575, W586.7
Size, shape: The burial pit is oval in flat plan, 52 x 82cm, with slightly in-sloping walls and a rounded bottom.
Comments: This burial was dug into and slightly deeper than two intersecting trash pits. Because of the homogeneity of the burial

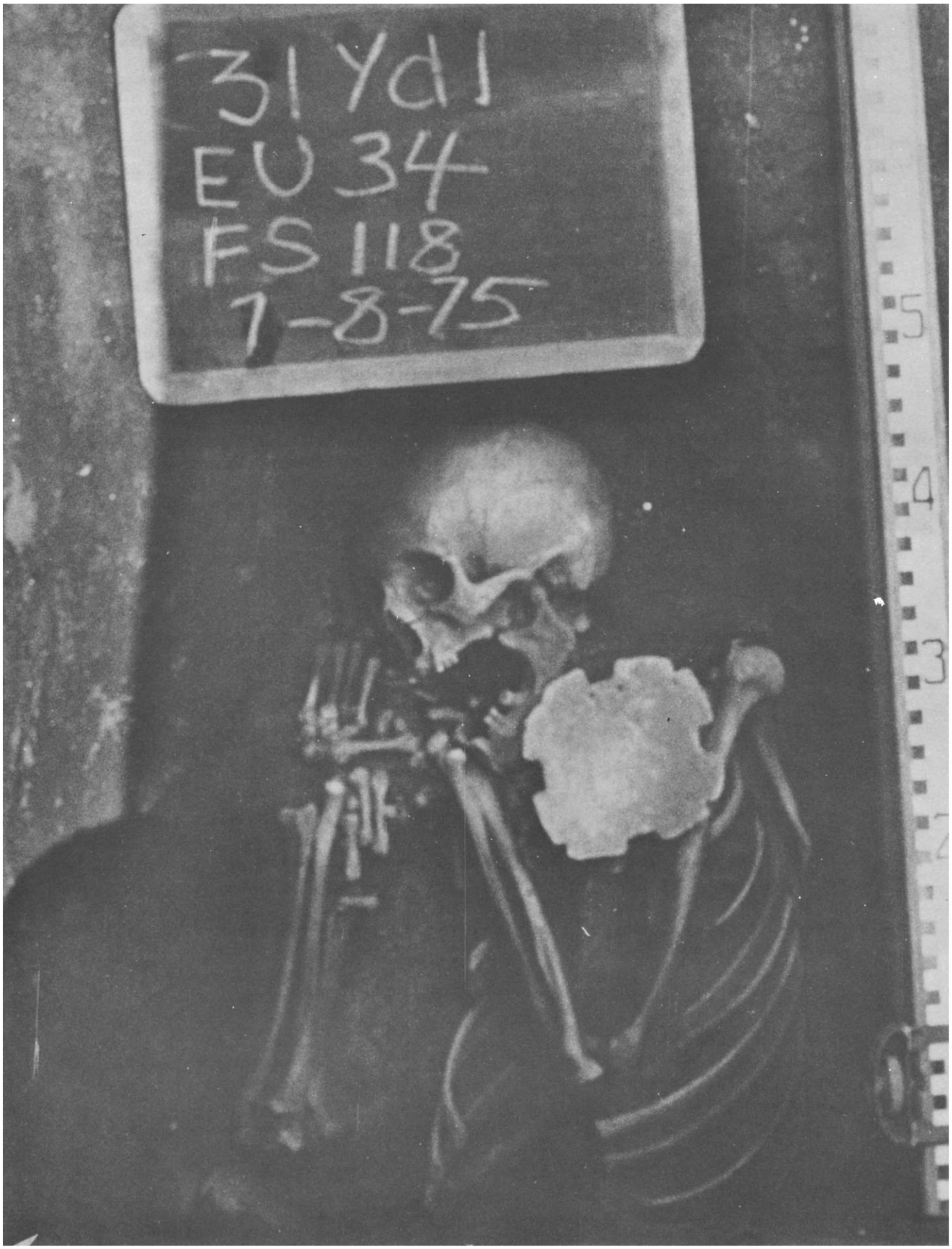


Figure 11. Burial 34-118, Donnaha Site (31Yd9).

Figure 12. Burial 34-143, Donnaha Site (31Yd9). Note bone pin below mastoid.

fill and the trash pit midden, no grave outline could be defined above the level of the skull, (97 cm below surface).

The skeleton lay on its back, the skull to the northwest. The legs were flexed, and the arms arranged to place the left hand on the pelvis, the right hand on the right side of the chest. No grave goods or ornaments were present.

An arc of posthole stains was present 70 cm from this burial, surrounding it to the north and northwest. With some imagination the arc can be extended to the south of the burial but the symmetry is lost, so the association of F.S. 34-144 with a structure remains doubtful. A profile across the area showed no evidence of a house floor.

F.S. 34-166 (Human Burial)
Depth: 50-147 cm below surface
Coordinates: N581.1, W591.3
Size, shape: The burial pit is circular, 95 cm in diameter, with straight walls and a flat floor.
Comments: The skeleton was fully flexed with both hands near the left shoulder. The body was laid on its back with the head to the northwest. No grave goods or ornaments were found, but a persistent dark stain surrounded the upper sides of the bones, staining portions of the skull and most of the long bones.

A lens of charcoal was found along the western margin of the pit at 61 cm below surface. Because the lens is continuous, it is unlikely that it was disturbed by the interment, but rather is fill from on or near the living surface at the time the burial was made. This charcoal yielded a date of 810 ± 70 radiocarbon years: A.D. 1140 (Beta 3266).

F.S. 34-78 (Trash Pit)
Depth: 78-96 cm below surface
Coordinates: N578.2, W589.9
Size, shape: Circular, 75 cm in diameter, with vertical walls and a rounded bottom.
Comments: Although rather shallow, this pit was packed with refuse, including shell, burned and unburned animal bone, sherds, charcoal and--most prominently--over 300 broken river cobbles which appeared to line the pit. The pit itself showed no evidence of burning. Three flotation samples (30 liters total) yielded abundant fish and reptile remains. A C-14 sample from the pit produced an anomalous date of 2010 radiocarbon years ± 120: 60 B.C. (Beta 3267).

This pit was intrusive into another, more shallow oval depression which contained little refuse.

F.S. 34-68 (Trash Pit)
Depth: 76-105 cm below surface
Coordinates: N577.6, W588.6
Size, shape: The pit was approximately oval in flat plan, but its original shape had been altered by an intrusive (unexcavated) feature on its south side. Dimensions are 55 x 100 cm; the walls are sloping and the floor uneven but generally rounded.

Comments: This pit yielded abundant amounts of unburned animal bone and shell, potsherds, a few large river cobbles and a great deal of charcoal. Unfortunately, the C-14 sample submitted from this feature was destroyed in a laboratory accident.

F.S. 34-85 (Cache Pit?)
Depth: 55-125 cm below surface
Coordinates: N578.8, W586.8
Size, shape: The plan of this feature has been altered by an intrusive burial (F.S. 34-143), but the intact portion suggests it was circular and 1.2 m in diameter. The eastern edge is bell-shaped in cross-section, while the other walls are in-sloping to a flat floor.
Comments: The fill of this pit was lighter in color than the midden soil surrounding it, and relatively few artifacts or debris were found.

F.S. 34-135 (Trash Pit)
Depth: 119-181 cm below surface
Coordinates: N577.5, W586.3
Size, shape: Only part of this feature was exposed but that portion suggests a circular shape ca. 1 m in diameter. The walls are straight and the floor is rounded but uneven.
Comments: Apparently this pit was filled by a series of "discard episodes", as reflected by lenses or concentrations of refuse. These include a large lens of mussel shell, a deeper sherd concentration that allowed a partial vessel reconstruction, and a 15 cm stratum of especially dark soil just above the pit floor. Charcoal found among the large net-impressed sherds yielded the date mentioned earlier, A.D. 1480.

F.S. 34-140 (House Pit?)
Depth: 94-124 cm below surface
Coordinates: N575.5, W586.5
Size, shape: The size is unknown, but it is at least 1.6 x 2.8 m. Although irregular in flat plan the edges were readily visible during excavation. The walls are slightly sloping and the floor irregular but approximately flat.
Comments: This large sprawling stain was filled with mottled soil and occasional artifacts, bits of shell, bone and charcoal. Its origin is not at all clear, and the feature provided one of the most puzzling anomalies of the season. One interpretation involved the arc of posthole stains visible around most of the pit perimeter: if these represent one or more structures, then the depression represented by F.S. 34-140 may be a result of continuing trampling and cleaning inside the walls. This would lower the floor and produce what appears to be a pithouse. The feature was only partially exposed by our work, and that part was not completely excavated. Burial 34-144 was intrusive into the feature.

F.S. 34-127 (Trash Pit)
Depth: 85-150 below surface

Coordinates: N575.7, W588.3
Size, shape: Oval in flat plan, 40 x 65 cm. The walls were slightly in-sloping and the bottom rounded, giving a basin-like cross-section.
Comments: This pit was originally dug through the lower portion of the midden and backfilled, evidenced by its appearance at 50 cm below surface as a lighter stain, yellowish in color, outlined against the darker midden-matrix. Contents included abundant shell and animal bone, fire-cracked rock, sherds and a complete fishhook (Fig. 27b).

F.S. 34-132 (Trash Pit)
Depth: 85-111 cm below surface
Coordinates: N582, W589
Size, shape: Circular in flat plan, 60 cm in diameter. The walls sloped into a rounded bottom.
Comments: Despite its prominently stained fill, this feature produced only a few sherds, bone fragments and firecracked rock.

F.S. 34-137 (Trash Pit)
Depth: 68-76 cm below surface
Coordinates: N577.2, W590.2
Size, shape: Oval in flat plan, 60 x 80 cm. The walls are gently sloped.
Comments: Only a small section of this feature was excavated because the remainder lay under baulks separating four 2 m squares until the last days of the season. Its function as a trash pit is based on the contents of the excavated area--it probably is considerably deeper at its center. Large portions of two crushed vessels and sherds of at least three other vessels were found, along with abundant shell, animal bone, charred nutshells and fire-cracked rock.

F.S. 34-152 (Trash Pit)
Depth: 86-95 cm below surface
Coordinates: N576, W590.5
Size, shape: Oval in plan, 47 x 70 cm. The walls slope into a rounded bottom.
Comments: This small pit was packed with mussel and snail shell; other debris, while present, was scarce. The pit overlaps, and is intrusive into, feature F.S. 34-155. A posthole stain is present in the bottom of the pit.

F.S. 34-155 (Trash Pit)
Depth: 86-110 cm below surface
Coordinates: N576.2, W591
Size, shape: Circular in flat plan, 1 m in diameter. The walls are slightly in-sloping, and the floor is uneven but approximately flat.
Comments: This pit yielded an abundant assortment of broken river cobbles, shell, animal bone, potsherds and debitage. Interestingly, the mussel shells are smaller than those from the intrusive F.S. 34-152.

F.S. 34-114 (Trash Pit?)
Depth: 81-151 cm below surface
Coordinates: N577, W592
Size, shape: Sinuous and irregular in flat plan, with nearly vertical walls and an uneven floor. It is at least 1.4 x 2 m in size.
Comments: This feature was only partially exposed and excavated, and its origin and/or function remains unclear. The fill was quite dark and contained animal bone, shell and occasional pieces of debitage and ceramics.

F.S. 34-138 (Trash Pit)
Depth: 81-147 cm below surface
Coordinates: N579, W591.6
Size, shape: At least 80 x 160 cm, probably oval in plan. The walls were in-sloping near the top, then vertical to a flat floor.
Comments: Also only partially exposed and excavated, this feature contained a great deal of shell, potsherds and animal bone. The lobed outline of its exposed southern edge suggests that two intersecting pits may be represented. If so, neither could be isolated and it was dug as a single feature.

F.S. 34-201 (Trash Pit)
Depth: 93-145 cm below surface
Coordinates: N574.2, W587.6
Size, shape: At least 80 x 90 cm, probably oval in plan. The walls slope in gradually to a rounded bottom.
Comments: The contents of this pit include mussel and snail shell, fragmented animal bone, broken river cobbles and occasional artifacts. Several very large potsherds from a single vessel were present, along with a soapstone pipe fragment (Fig. 181).

Excavation Unit 35 Area

Three conjoined excavation units are included in this discussion, namely 35, 37, and 39. These were located 4 meters east of the larger E.U. 34, and exposed the following features.

F.S. 35-4 (Disturbed Human Burials)
Depth: 58-140 cm below surface
Size, shape: Circular in plan, 1 m in diameter, with vertical walls and an uneven but approximately flat floor. The walls are stepped on the west side at about 1 m below surface.
Comments: Between 60 and 70 cm below surface this pit produced a cranium and two long bones of two individuals, all fragmentary and unarticulated. A few small fragments were found deeper in the pit along with minor amounts of animal bone, shell and artifacts. This may be an aboriginal pit that intercepted a previous burial, but the position of the human bones--high in the pit fill--make it more likely a relic-hunter's hole. This also is supported by a charred piece of wood, 30 cm long and 1 cm wide, associated with the bones; pieces of wood this large were not present in any of our excavations at Donnaha.

F.S. 35-7 (Pit)
Depth: 58-94 cm below surface
Coordinates: N579.5, W582
Size, shape: 1 x 2 m, oval in flat plan and basin-shaped in cross-section.
Comments: This pit contained a moderate amount of refuse, but no more than is found in the undisturbed midden stratum. It may be a result of relic-hunters' depredations.

F.S. 37-6, 37-7 (Human Burials)
Depth: 75-107 cm below surface
Coordinates: N583.3, W581.6
Size, shape: Oval in flat plan, 50 x 85 cm, with slightly sloping walls and a rounded bottom.
Comments: This feature appeared, just below the midden stratum, first as a large ill-defined stain nearly 2 m long in the trench floor. The trench was lowered to better define the feature, and at 89 cm below surface, an isolated human cranium was discovered adjacent to the eastern trench wall, on the edge of the large soil stain. Fragmented human bones and bone beads were present elsewhere in the pit fill, and finally--at 99 cm below surface--the explanation was found, a fully articulated skeleton (F.S. 37-7) in the well-defined oval pit described above. This burial is fully flexed, lying on its right side with the skull to the northeast. The right hand lay near the face, the left hand on the chest, with the knees drawn up to the chest area. Clearly this burial intercepted an older but shallower grave, probably oval and roughly perpendicular to the second; the contents of this initial burial were incorporated in the fill.

It is interesting to note that the scattered remains of the older burial (F.S. 37-6) occur 25- 30 cm away from the margins of the second pit as discerned just above the articulated individual, indicating that this later grave had a much larger opening. Apparently a bathtub-size grave pit was begun (at least 90 x 100 cm) which tapered inward to the smaller oval we found. No grave goods could be associated with either interment, although the bone beads may have been ornaments with the original burial.

F.S. 37-15 (Pit)
Depth: 55-100 cm below surface
Coordinates: N584, W582
Size, shape: Approximately oval with irregular (sinuous) margins in flat plan, at least 75 x 80 cm. The walls were sloping and the bottom was rounded.
Comments: The contents of this pit included deer bone, sherds and flakes--shell was notable by its absence. The density of these materials did not exceed that of the over-lying midden, and the function of this feature is unknown. It was not completely exposed by our excavation.

F.S. 37-16 (Pit)
Depth: 55-91 cm below surface
Coordinates: N585.2, W582
Size, shape: Circular in plan, 50 cm in diameter. Walls were nearly straight, with the northern side slightly undercut. The bottom was nearly flat.
Comments: This feature contained very little cultural material, and its margins were poorly defined. Its function is unknown.

F.S. 39-4 (Pit)
Depth: 54-79 cm below surface
Coordinates: N581.5, W582
Size, shape: Circular to oval in flat plan, at least 37 x 85 cm. Walls were straight and the bottom was nearly flat.
Comments: Although well defined in the floor and wall of the excavation unit this pit produced no indication of its function. Its fill contained few artifacts, although the soil was darkly stained. The midden strata above the pit--the very dark zone and less dark but stained stratum beneath--are intact, confirming that the pit is not recent; it most likely dates to the earlier part of the Donnaha occupation.

F.S. 39-5 (Disturbed Human Burial)
Depth: 54-99 cm below surface
Coordinates: N581.8, W581
Size, shape: Probably oval in plan, ca. 55 x 130 cm. The walls are sloping and the floor is very uneven, varying from 76-99 cm in depth.
Comments: This pit contained the usual midden assemblage of animal bone, sherds, shell and lithics, but in low frequency. Also scattered through the fill were badly fragmented human remains, including portions of the cranium. Jumbled stratigraphy above the pit suggest it was dug by a relic-hunter.

Excavation Unit 36 Area

Originally this Excavation Unit consisted of a 1 x 4 m trench, located 4 m east of Excavation Unit 35 and just below the levee crest on the riverine slope. Here the undisturbed midden is thinner than in the more westerly and higher units, measuring 10-20 cm thick and overlying a yellow-tan sterile sand. The plow zone contains cultural debris and is darkly stained, averaging about 20-30 cm thick.

In order to fully expose features present in the original trench, the unit was expanded to the north and south, and a 2-meter square (with its own extension) dug adjacent to the trench's west end. Two Excavation Unit designations were assigned to these contiguous units, 36 and, at the west end, 38.

F.S. 36-3 (Disturbed Human Remains)
Depth: 26-42 cm below surface
Coordinates: N579.5, W571

Size, shape: see below
Comments: This "feature" consists of fragmentary human bone of two individuals scattered across the entire third of the initial trench. The bones occur immediately below the plow zone in the midden and the top of the underlying sterile sand, along with an occasional shell or bone bead, mussel shells and potsherds. No evidence of a pit can be seen enclosing these remains, although F.S. 36-9 is immediately to the north.

F.S. 36-9 (Disturbed Human Burial)
Depth: 54 x 111 cm below surface
Coordinates: N580, W570.7
Size, shape: Circular in plan, 1 m in diameter. In cross-section the pit is bell-shaped with a slightly rounded bottom.
Comments: Contents include fragmentary human bone, shell beads, mussel shell and a few potsherds. Although the pit was unmistakably defined at 54 cm below surface, later examination of recording photographs show disturbance of the normal stratigraphy directly below the plow zone. This suggests that the feature may be of recent origin, dug by a looter seeking (and finding) a human burial. The F.S. 36-3 remains could represent portions of this same individual.

F.S. 36-7 (Disturbed Human Burials)
Depth: 30-98 cm below surface
Coordinates: N580, W573.3
Size, shape: Subtriangular in plan, 120 x 150 cm. Walls are sloping and the bottom is rounded.
Comments: Like the above, this feature contained minor amounts of midden refuse with human bone fragments and three shell beads. The pit was defined as a feature of 47 cm below surface, immediately under the midden, but examination of the profile reveals the disturbance extending upward to the plow zone. In consideration of this, coupled with the badly damaged human remains and beads (ordinarily very rare in the midden), this pit likely is a recent relic-hunter's work.

F.S. 38-5 (Human Burial)
Depth: 44-54 cm below surface
Coordinates: N580.1, W575
Size, shape: Oval in plan with a flat bottom.
Comments: This shallow burial was not detected until the skeleton was struck because the pit lay entirely within the midden stratum. The skeleton, that of a juvenile, is resting on its right side with the legs slightly flexed. The left arm lay on the pelvis; the right arm was slightly bent with the hand in front of the pelvis. The skull is to the east. Directly around the bones was present an especially dark stain, possibly a decayed wrapping or shroud but equally likely produced by soft tissue.

F.S. 38-7 (Pit with Intrusive Human Burial)
Depth: 51-81 cm below surface

Coordinates: N579.5, W575
Size, shape: Subrectangular in flat plan with straight sides and a flat bottom, 65 x 80 cm.
Comments: There are two episodes represented by this feature, which actually consists of a pit within a pit. The first episode involved excavation of the large pit described by the above measurements. The second was the excavation of a smaller oval pit into the fill of the larger feature. This later pit accommodated the burial of a child, present at 62-74 cm below surface.

The darker burial pit measures 30 x 45 cm, and the skeleton lay with the head to the northeast. Two bone beads were present below the mandible, but the remaining bones were badly decayed and the burial's posture could not be determined.

The function of the older, larger pit is unknown. Midden debris was present but not abundant, and no human bone was found.

F.S. 38-6, 9 11 (Disturbed Human Burials)
Depth: 36-165 cm below surface
Coordinates: N581, W576
Comments: This set of features is a tangle of disarticulated human bone, much of it fragmentary, scattered along the west wall of the Excavation Unit 38, a 2 m square, and over almost all of the northwestern extention to that square. All this area has been so badly disturbed that individual pits could not be accurately recorded.

F.S. 38-6 is a group of long bones clustered just west of F.S. 38-7, below the plow zone. These bones were capped by a thin but uninterrupted midden stratum and thus seem to be in their jumbled condition as a result of prehistoric disturbance, possibly the interment of the individual represented by F.S. 38-9. That skeleton had only the lower left leg articulated, present at 109 cm below surface and oriented to suggest the skull was to the east or southeast. These articulated bones were present in a very large stain extending 150 cm north and 100 cm west, which also contained a third concentration of bone in deposits as deep as 165 cm below surface. The third concentration was designated F.S. 38-11.

The extention northwest of the 2 m square revealed stratigraphic disturbance directly below the plow zone, strongly suggestive of relic-hunters' digging. It seems that this recent pit largely destroyed burials F.S. 38-11 and most of F.S. 38-9 (perhaps already damaged by the F.S. 38-11 interments). Six bone beads were found at various locations in the fill.

F.S. 36-19, 20 (Human Burial and Intrusive Trash Pit)
Depth: 20-115 cm below surface
Coordinates: N577, W573
Size, shape: The trash pit probably is circular (it was not completely exposed), 1 m in diameter. In cross-section it is barrel-shaped with a flat bottom.
Comments: The skeleton was lying in a thin midden stratum, 39-56 cm below surface, on its back with the skull to the northeast. Only the skull and upper torso is intact, the remainder having been neatly

truncated by the deep trash pit F.S. 20. A circular hole 2 cm in diameter in the right parietal testifies to pot hunters' methods--use of a probe.

The trash pit originates immediately below the plow zone. It contained an abundance of cultural debris including mussel shell, animal bone (and human bone from the encountered burial), sherds, charcoal and fire-cracked rock. Interestingly the contents showed as a series of basin-shaped lenses suggesting the pit filled not incrementally but as a result of specific discard episodes (Fig. 13)

F.S. 36-22 (Trash Pit)
Depth: 27-58 cm below surface
Coordinates: N578, W571.5
Size, shape: Probably oval, 80 x ca. 130 cm in plan (not fully exposed). The walls sloped inward to a rounded bottom.
Comments: Like the trash pit above, this feature was detected immediately below the plow zone. It contained a dense concentration of animal bone, shell and sherds and minor amounts of charcoal, along with some fragmentary human remains.

Excavation Unit 40

Near the end of the 1975 season we began our last excavation unit to the north of all previous work. Again using our aerial photographs from 1973, and now additional ones from the spring of 1975, we situated the initial 1 x 4 m trench so as to intersect the edge of the dark midden zone. We hoped to locate any structure--such as a palisade--which may have confined the accumulation of trash visible in the photos. This was admittedly a long shot (with a short trench), but worth a try while remaining crew members were engaged profiling, removing baulks, and photographing the excavations in E.U. 34. In the E.U. 40 area, which we assumed was peripheral to the main occupation, we did not expect another series of complicated features. We got them anyway.

The stratigraphy consisted of a 25-30 cm plow zone on top of 25 cm of midden. The midden contained a great deal of mussel shell, more than we encountered anywhere else in the site. Below, the midden soil graded into sterile yellow sand present at 65 cm below surface, separated from the midden proper by a 10-15 cm zone of mottled sand and occasional cultural detritus. Shell from the undisturbed midden (upper portion) yielded a C-14 date of 700 $\pm$ 70 radiocarbon years: A.D. 1250 (Beta 3264). (This date has not been corrected for isotope fractionation).

F.S. 40-3 (Trash Pit. Fig. 6)
Depth: 41-124 cm below surface
Coordinates: N643, W648.2
Size, shape: Circular to slightly ovate, 75 cm in diameter. The walls are vertical and the floor is lightly dished, nearly flat.
Comments: Contents included several pieces of human bone including a large section of the occiput; we were later to find that this pit decapitated a burial just to the north (F.S. 40-13). In addition

Figure 13. Trash pit 36-20, Donnaha Site. Note strata in pit fill.

were great quantities of burned and unburned animal bone, large sherds, lithic debris and two very large manuports, unburned river cobbles weighing ca. 5 kg each. Materials were present in "lenses" as observed before in F.S. 36-20.

F.S. 40-5 (Dog Burial)
Depth: 35-63 cm below surface
Coordinates: N643.3, W639
Size, shape: Oval in plan, 30 x 45 cm, with slightly in-sloping walls and a flat bottom.
Comments: The burial was made while the shell midden was accumulating, shown by shell in the fill but also in an uninterrupted zone above the burial, just under the plow zone (Fig. 14). The dog was immature, approximately 5-6 months of age when it was buried.

F.S. 40-9 (Human Burial)
Depth: 64-73 cm below surface
Coordinates: N644.2, W638.2
Size, shape: Oval in flat plan, 38 x 75 cm. The pit floor is flat, and walls appear to be vertical.
Comments: This burial was first detected in the north wall of the 1 x 4 m trench, but careful inspection of the profile available showed no evidence of a grave outline until 64 cm below surface, just above the skeleton.

The burial is that of a child, laid on its right side in a flexed position, with the head to the south. The legs are bent at a right angle to the pelvis, and the left arm is bent to place the hand near the face. The condition of the bones is poor--the left arm was decayed (or missing) as were most bones of the trunk. No grave goods or body ornaments were present.

F.S. 40-13 (Human Burial)
Depth: ca. 50-95 cm below surface
Coordinates: N643.8, W637.9
Size, shape: Oval in plan, 40 x ca. 70 cm. Grave walls are straight and the bottom is flat.
Comments: The southwestern end of this feature was truncated by the trash pit F.S. 40-3, which also removed the skull, scapulae and several ribs. The remaining bones are in good condition, and indicate the person was lying on the right side with the knees flexed near the chest. The left arm was across the abdomen, the right arm bent back to place the hand at the face.

F.S. 40-10, 12 (Human Burials)
Depth: 56-117 cm below surface
Coordinates: N640.6, W638.5
Size, shape: Roughly oval in plan, 85 x 100 m. Walls are straight to gently sloping, the bottom slightly rounded.
Comments: This feature, and the measurements given above, was created by two burial pits, one oriented north-south and one northeast-southwest. The initial burial was made at a depth of 87 cm

Figure 14. Profile of west wall of E.U. 40, Donnaha Site. Note dog burial partially exposed, lower right.

below surface, with the head to the northeast. We found only the skull and one (articulated) foot of this individual in situ, because the second burial was made directly through the earlier, scrambling its bones. The second individual lay at 117 cm below surface in a straight-walled oval pit 40 x 80 cm, oriented north-south with the skull to the north. The body was laid on its left side, knees drawn to the chest, with the right hand on the left shoulder and the left arm bent to position the hand at the face. No grave goods or ornaments were in association with either skeleton.

DISCUSSION OF FEATURES

Human Burials

An intriguing set of problems is presented by the burials, problems involving both persistent regularities of burial mode and variation which may have been accorded by status. Without exception the skeletons are flexed in circular or oval pits. Considering those complete enough for determination, 15 out of 19 had one or both hands at the face or shoulder; 10 lay on the right side, 10 on the back, and only two on the left side.

Orientation of the body is not recognizably patterned, however. Categorizing according to compass quadrants, 7 had the head to the northeast, 8 to the southeast, 3 to the southwest, and 6 to the northwest. If the rising-setting points of the sun are considered as possible determinants of burial orientation, no strong pattern is apparent. At the Donnaha latitude, sunrises during a year move through a 60 degree arc in the east (30 degrees north of east to 30 degree south of east), and sunsets inscribe a second 60 degree arc in the west. Of 22 burials suitable for measurement, 11 fell within either of these arcs with regard to direction of the skull (defined by a skull-pelvis line). A chi-square of 2.81 shows the association significant at the .10 level, but this is far from convincing.

Trash Pits

Several of the features labeled as trash pits in the foregoing pages present no convincing evidence that such was their purpose, being filled with ordinary midden soil. Admittedly these features may have other origins --pothunter holes, holes dug by dogs, children at play--and the absence of unusually dense trash deposits in these has been duly noted. It is most unlikely that pits were dug for the storage of perishables. No trace of lining was found in any, and without lining moisture or rodents would quickly intrude in the loose sandy soil, even if the pit walls did not collapse first.

Some pits were intentionally used as trash repositories as shown by stratigraphic evidence of discrete discard episodes and/or unusually dense concentrations of refuse. These are of interest because they represent a second midden. In analyzing these features--34-152, 34-155, 34-78, 34-68, 36-20, 36-22--we are trying to determine (a) patterning of refuse shared by these pits but not by midden refuse, and (b) definition of the behavior which would produce the differential patterning. Despite our intentions, it was

frustrating to attempt to distinguish between the fill of these pits and the contents of the midden. Construction of cumulative graphs did produce different profiles for the two refuse areas (pits vs. midden) but inspection revealed that this was due primarily to two variables, bone and shell, usually more abundant in the pits. When bone weight was used (rather than count) the differences largely disappeared, suggesting post-depositional taphonomic processes produced the initial distinctive profiles. Calculation of various artifact classes as actual representation (as opposed to proportion per unit volume) likewise showed no pattern other than ones easily attributable to N- or C-transforms. For example, sherds from the pits are fewer but larger, probably because they have not been exposed to trampling and post-depositional breakage or recycling.

Only one persistent difference was found when comparing the trash pits to midden deposits: the ratio of shell to animal bone. A sample of fifteen 600 l samples from the midden yielded a ratio varying between 2.57 and 0, with a mean of .46. Using fill from 14 trash pits, with volume ranging from 746 l to 79 l, the ratio usually varied from .29 to 2.95 with an average of 1.64. (Two pits had much greater amounts of shell [F.S. 34-135 and F.S. 34-152] and, if included in the calculations, would produce a huge disparity in the mean ratios). The differences between midden and pit deposits can be seen in the six representative samples shown in Figure 15, and the tabulations in Tables 1 and 2; application of inferential statistics would be honorific in this case. The differences exist most notably in the E.U. 34 and 36 areas; in the E.U. 15 and E.U. 40 areas the relationship is reversed, but here the sample of undisturbed trash pits is small.

The evidence from E.U. 34 suggests that pits were utilized as trash repositories when mussel shells comprised the bulk of food refuse. They certainly are not mussel steaming pits such as those described by Winters (1969:90), nor is the mussel present by virtue of enhanced preservation since burial pit fill contained a ratio of .53, i.e. in the midden range. Because of the low food value of these shellfish (Parmalee and Klippel 1974) and their rapid spoilation, presumably large numbers would be collected when possible and consumed within a brief period of time, producing a waste heap difficult to ignore. While more incremental waste might be disposed of by the expedient of midden deposit, the shells--not attractive to bone-chewing dogs--may have prompted a gathering of trash and its deposition in a pit, especially in an area of the site where structures bespeak a population concentration (e.g. E.U. 34).

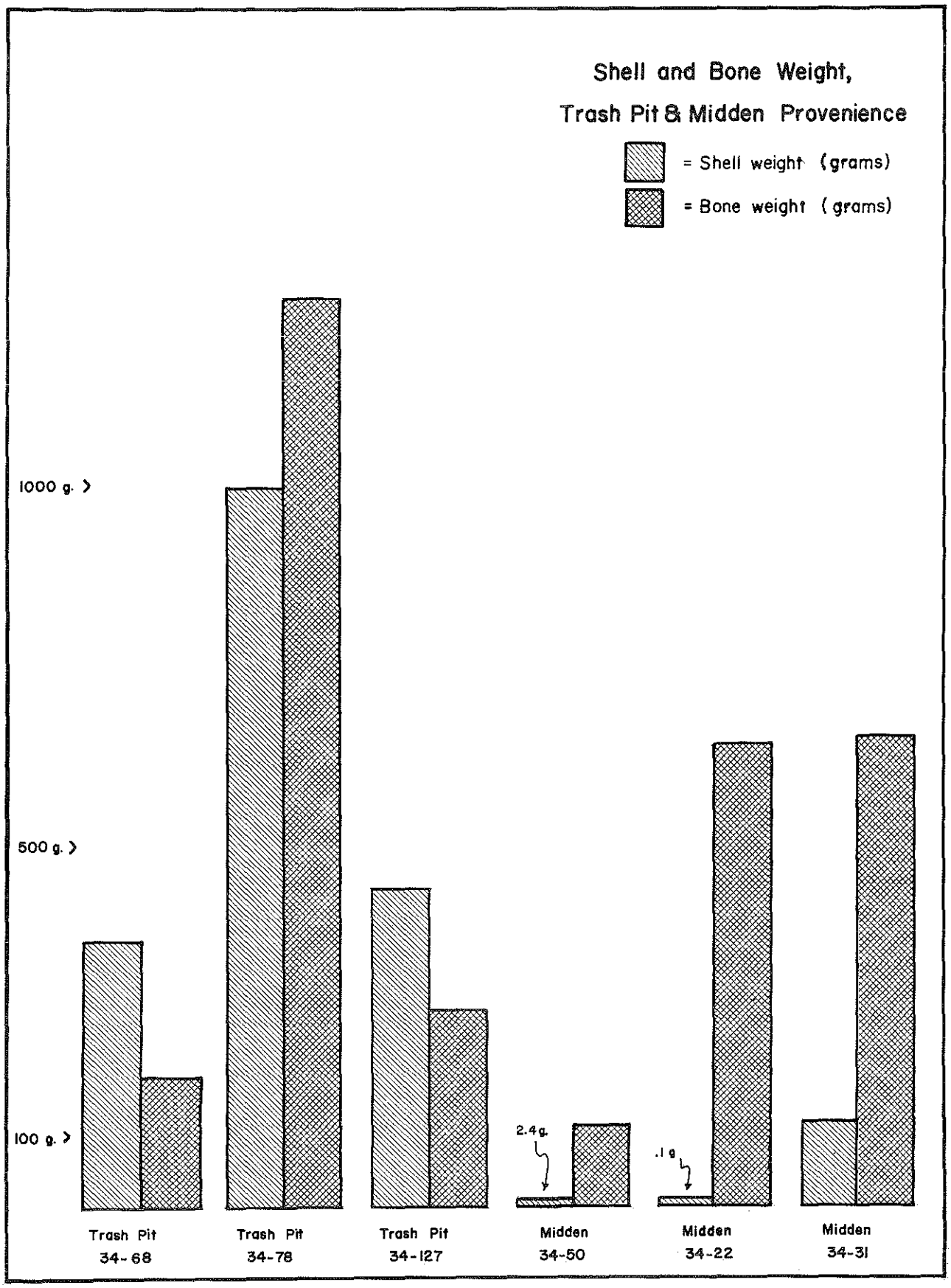


Figure 15. Graph of bone and shell ratios in trash pits and midden, Donnaha Site (31Yd9).

Table 1. Shell and animal bone weights in trash pits, Donnaha Site.

PROVENIENCE	SHELL WEIGHT (g)	BONE WEIGHT (g)	SHELL WEIGHT / BONE WEIGHT
16-5	2177.1	7607.75	.29
18-9	1080.9	828.1	1.30
24-8	742	581.2	1.28
26-4	1610.4	1128.5	1.43
34-68	369.2	180.1	2.04
34-78	997.2	1257.5	.79
34-127	792.3	578.5	1.37
34-135*	4950.0	798.4	6.20
34-137	439	272	1.61
34-152*	2845	9	316.11
34-155	1735	635	2.73
34-201	3072	1871	1.64
36-20	2959	1299	2.28
36-22	489	166	2.95

x = 1.64

* excluded from calculations

Table 2. Shell and Animal Bone Weights in the Midden, Donnaha Site.

PROVENIENCE	SHELL WEIGHT (g)	BONE WEIGHT (g)	SHELL WEIGHT / BONE WEIGHT
16-2	3526.9	1371.8	2.57
16-3	2077.35	1787.4	1.16
18-4	21.1	414.3	.05
22-2	370.3	804.6	.46
22-3	93	92.8	1.00
34-22	.1	637.4	.00
34-24	172.1	1010.9	.17
34-31	115	646	.18
34-34	.05	308.8	.00
34-50	2.4	112.8	.02
34-54	3.5	87.7	.04
34-55	92.1	165.5	.56
34-81	15.6	617.8	.03
34-84	78.7	963.5	.08
35-3	578.8	1072.6	.54

x = .46

These speculations can be modeled so as to produce an hypothesis involving the season of shellfish availability. If shellfish debris was a factor in disposal mode selection, then trash pit contents will indicate pit disposal primarily during the season of shellfish availability. From this theory the null hypothesis is: there is no relationship between deposition and yearly seasons. At this stage of our analysis only the sketchiest evidence can be brought to bear on testing the null, but these results are encouraging--both nutshell remains and deer frontals with attached antler are more common in the trash pits than in the midden.

Structures

This section is entered with hesitation because we are not convinced the post hole patterns or features actually define structures in the usual sense, i.e. houses. Certainly additional data are needed and we hope to collect such in forthcoming seasons. Present evidence only suggests three types of structures:

(a) Burial structures. These are small, round to oval structures encircling a human burial. Despite the small size (1.5-2.2 m in diameter), at least one of these was used for some purpose which resulted in an accumulation of midden debris within the posthole circle, followed by a burial through the floor and burning of the structure. Of two other examples of these structures, one was only partially exposed (F.S. 34-56), and the other was either partially obliterated by later features or did not inscribe a full circle (F.S. 34-118). Interpretation of these structures includes summer houses or ramadas, field houses, structures internal to a large house not revealed by our excavations, or specially constructed burial enclosures that may index differential status of the deceased. Regarding the last, it is of interest that two of the three burials within, or probably within, such structures wore the only marine shell gorgets found. Clearly additional work is needed to clarify the function of the so-called burial structures. There is no evidence that these structures or others at Donnaha had wattle-and-daub construction.

(b) Pit house. This is a square or rectangular structure ca. 2.8 m wide with an opening to the west. The walls of the pit are gradually sloped, and it seems likely that the pit formed incidentally as a result of traffic and periodic cleaning of the sand floor. Only one example was found, and it was only partially excavated (F.S. 34-140). No internal features other than an intrusive burial were found, and again additional excavation is necessary.

(c) Surface house? The single example was described for the E.U. 1 area. A series of post holes appear to define about half of an oval structure, but erosion has removed any occupation surface once present, leaving only the lowest portion of the postholes. Whether these represent a surface house, a pit house, or some other structure is unknown, but in the absence of these data we are classifying it separately.

THE ARTIFACTS

To write that artifacts were abundant at Donnaha would be an illustration of understatement. From E.U. 34 alone over 18,000 potsherds were retrieved, and the total excavations yielded hundreds of thousands of bone, stone, shell and ceramic items. At this writing three theses are in preparation dealing with the lithic, ceramic and bone assemblages, and a more complete account will be rendered by those works. The sections following are intended to provide an initial overview of the Donnaha material culture with no pretense of exhaustive analysis.

The Shell Assemblage (Table 3)

The Donnaha occupants used shell in the form of gorgets, beads, and tools. Interestingly, the bulk of the shell used for beads or gorgets was imported from coastal areas, either in a finished state or, less likely, as raw materials.

Beads

Marginella. Specimens of Marginella apicina were used as beads by abrading the body whorl below the spire to expose the interior cavity (Fig. 16c). Presumably these were strung by passing a thread through the natural aperture and the hole thus formed. The species apicina is common in shallow coastal bay waters from Florida to the Carolinas (David Phelps, personal communication).

Olive Shell. A single olive shell (Oliva sp.) was found, its spire removed presumably to allow stringing and use as a bead (Fig. 16a).

Disc. Ranging in diameter from 4-15 mm, these flat disc beads were cut from unidentified marine shell. A diameter of 6-7 mm is most common; thickness varies from 2-6 mm, with the 2-3 mm range preponderant (Fig. 16h).

Tubular. These beads vary in outline from tubular to barrel-shaped, 10-20 mm in length. Apparently they were manufactured from conch columnellae (Fig. 15b, f).

Subrectangular. The single bead found is flat and roughly rectangular in outline, drilled through its center. Measurements are: length, 26 mm; width, 17 mm; thickness, 2 mm (Fig. 16e). This specimen is of marine shell.

Gorgets. Both gorgets are made of conch shell, cut to an oval shape in one instance (Fig. 17a) and carved in the other (Fig. 17b). Neither exhibits any other modification except for the two suspension holes. Two additional gorgets in the Douglas Rights Collection, almost certainly from Donnaha, resemble very closely the specimens we recovered (Rights 1947: Plate 77, upper right and lower left).

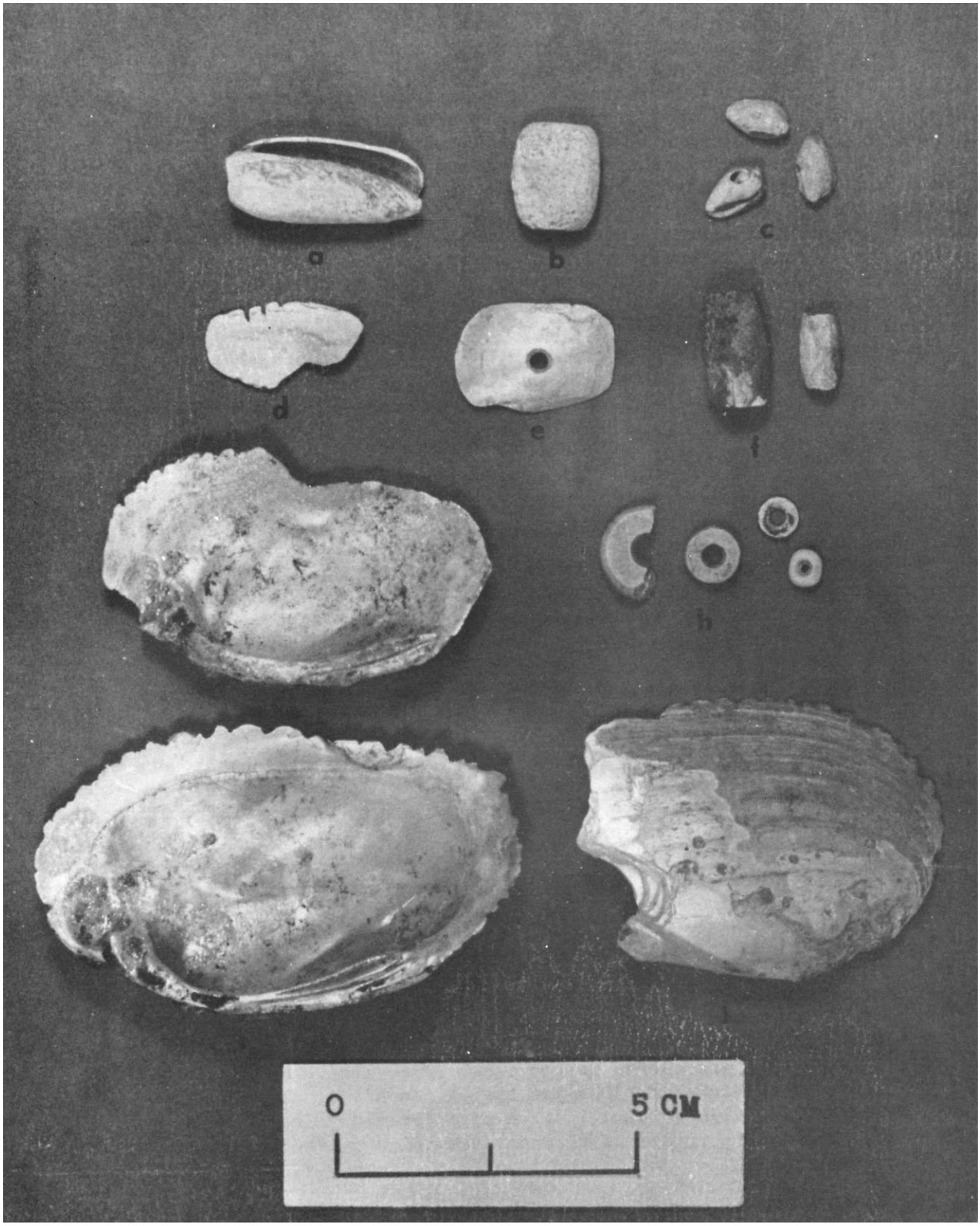
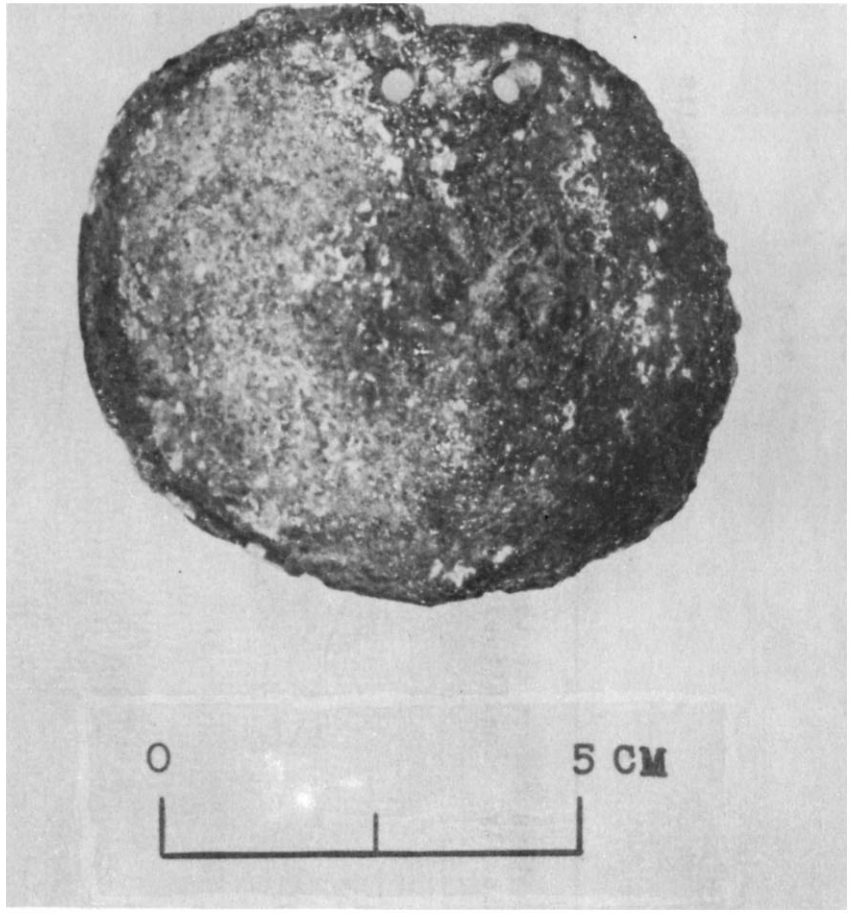


Figure 16. Shell artifacts from the Donnaha Site. Olive shell bead (a); tubular beads (b,f); marginella shell beads (c); subrectangular shell bead (e); disc beads (h); and shell scrapers (d,g,i,j).



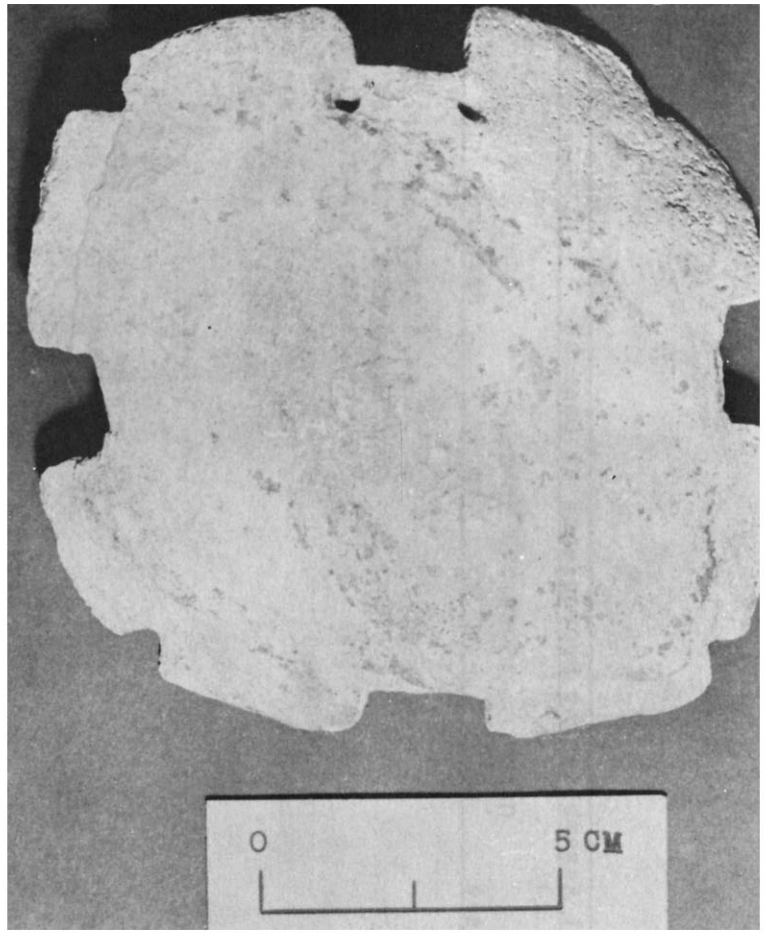


Figure 17. Shell gorgets from the Donnaha Site. Oval shell gorget (a); carved shell gorget (b).

Table 3. Shell Assemblage by Provenience at Donnaha

	Surface	0-15 cm	15-30 cm	30-45 cm	Features	Total
Marginella Beads		1	1	1	24-5(248) 32-1 (720) 26-4 (1) 16-5 (2) 30-3(75)* 27-2(295) 32-1(238) 36-33 (1) 30-3(348)* 16-7 (2)	1,344
Olive Shell Bead	1					1
Disc Beads	2	16	3	11	16-5 (1) 22-3 (1) 34-135 (1) 22-6 (295) 36-20 (2) 36-9 (4) 34-201 (5)	911
Tubular Beads	3	38	23	14	34-143 (1) 17-3 (2) 34-109 (1) 16-5 (1) 34-140 (1) 34-135 (1) 36-7 (3)	88
Subrectangular Bead					37-7	1
Gorgets					34-56 34-118	2
Scrapers	1	1			36-19 16-5 36-20	5

* The 30-3 designation refers to the pit fill of Feature 32-1, the burial described previously. Constituent association, while likely, is not demonstrable.

Scrapers. These are fresh-water mussel shells denticulated along their anterior edge (Fig. 16d, g, i, j). Spacing of the teeth on these tools matches the striations observed on the interior of Donnaha sherds in accordance with the function ascribed by Coe (1952:311). Two of the four specimens recovered were found in association with an unusual abundance of fish remains, holding out the possibility that the shells also performed as fish scalers-- replicative experiments show they function quite effectively in this task.

It is of interest to note the distribution of different kinds of shell beads occurring as constituent associations with the burials, for here there appears a distinct pattern. Beads were found interred only with adult males and, when present with a burial, consisted of a single type of bead. On the single occasion where disc beads are associated with a burial (F.S. 22-5) other beads are present, but these are of bone and occupy a separate strand. Also the marginella beads were found only with skeletons in the E.U. 16 area, suggesting either temporal or social distance vis-a-vis the individuals buried in the E.U. 34-39 area. Finally, it should be noted that marginella beads, although abundant in certain burials are very rarely found in the midden where both disk and tubular specimens were common, suggesting that marginella, while seemingly "cheaper" to produce, were more intensely curated.

Although only two gorgets were recovered, their association shows a variation from the beads. The oval specimen was worn by an adult male, the carved one by a female (F.S. 34-118); both were in the E.U. 34 area.

Ground Stone Assemblage (Table 4)

Pipes. No complete pipes were found, but several unfinished or broken specimens reveal a variety of shape and size. Included is a small elbow pipe (Fig. 18c), an unfinished tubular pipe (Fig. 18j), a short stemmed specimen of biotite schist (Fig. 18i) and a "blank" for an elbow pipe. Additionally there are two pipe stems oval in cross-section, one with a pronounced groove on one surface (Fig. 18k, l), and several bowl fragments, only one with decoration (Fig. 18 f, h). Except for the schist specimen all are of the local soapstone.

There remains a piece of lineated gneiss 15 cm long and 4.4 cm wide, trapezoidal in cross-section. This piece may represent an unfinished pipe stem--it is broken at both ends and only crudely modified.

Bead. A tubular soapstone bead, 2 cm long, was found--it has been broken longitudinally (Fig. 18b).

Pendant. Flat and roughly triangular in outline, the pendant is serrated on two sides and has two encircling grooves at the top, presumably for suspension. This soapstone piece may be an effigy of a human face in profile, with the eye represented by a small pit (see arrow, Fig. 18a) on either side.

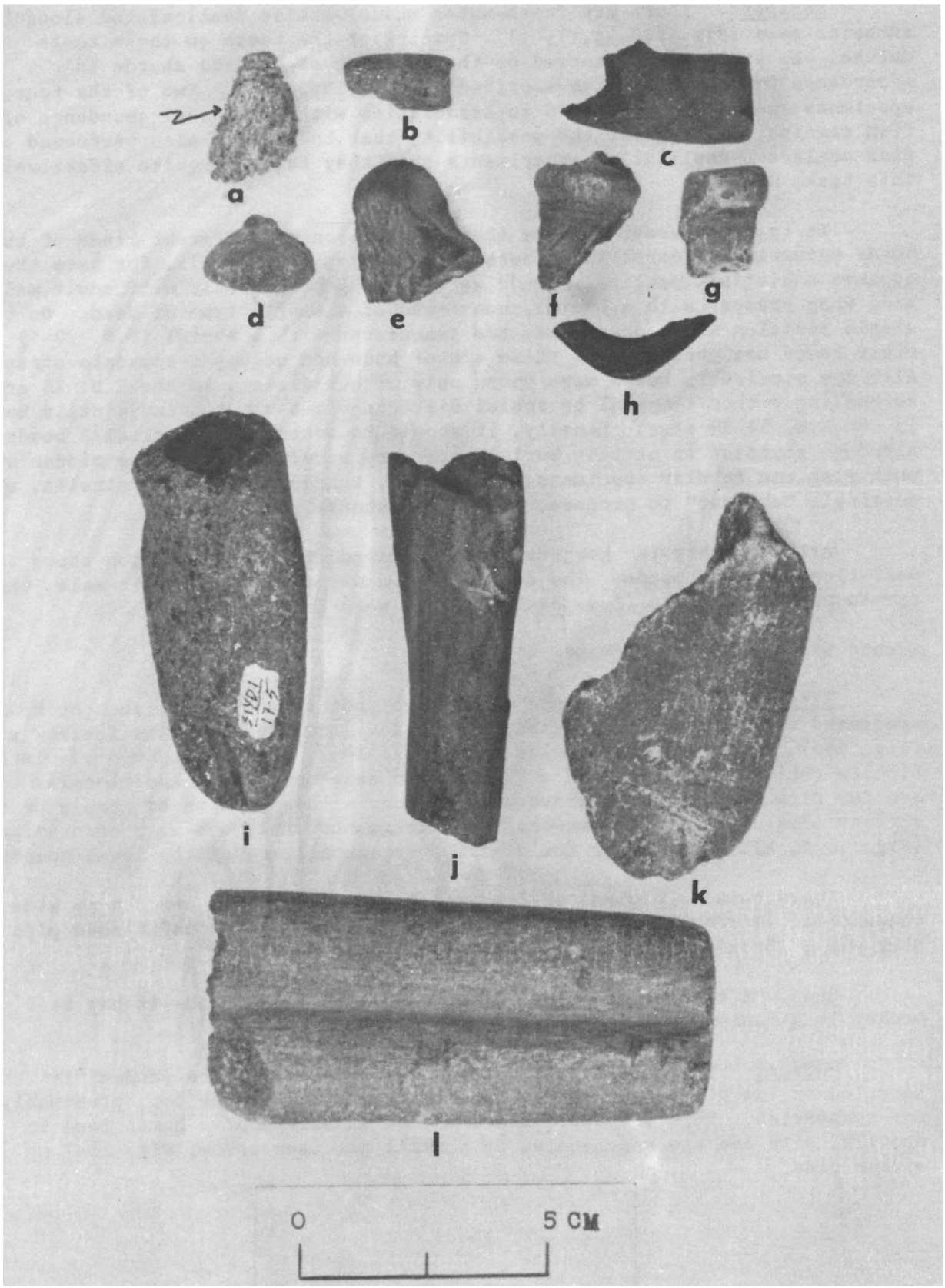


Figure 18. Ground stone artifacts from the Donnaha Site. Human effigy (?) pendant (a); bead (b); pipe fragments (c, f-l); labret (d); celt fragment (e).

Nutstones. The Donnaha nutstones are made on small, locally available river cobbles; all have multiple circular depressions (Fig. 19).

Celt Fragments. The bit portion of a very small celt was recovered, made on a felsite pebble or cobble (Fig. 18e). Magnification reveals numerous fine striations perpendicular to the working edge.

Labret (?). This is an oval soapstone object, 1.8 x 2.1 cm, with one flat, well-smoothed surface. The opposite side tapers to a broken protuberance. The artifact may be a broken labret or earspool, but its fragmentary condition disallows firmer identification (Fig. 18d).

Various. Ten fragments of soapstone exhibit evidence of modification, but all are too small to assign to an artifact class.

Table 4. Ground Stone by Provenience, the Donnaha Site

		Midden					
	Surface	0-15	15-30	30-45	45-60	Features	Total
Pipes	2	2	2	1		37-8 34-201 37-13 34-81 34-135	12
Bead		1	1				2
Pendant	1						1
Nutstones	1		3				4
Celt Fragment					1		1
Labret				1			1
Various	3	1	6				10

The Bone and Antler Assemblage (Table 5)

Awls. Seven specimens are complete and range in length from 8.5 to 13.5 cm in length. At least four awls are made on deer ulna with no modification of the olecranon (Fig. 20a, c-e), and one on a turkey tarsometatarsus (Fig. 20b). The remaining examples were made on mammal bone splinters (Fig. 20g) or split bird bone (Fig. 20f), probably turkey.

Needles. The only needles found were those mentioned in burial 34-143. The unbroken specimen is 8.1 cm long with a rounded tip (Fig. 20j, k). Both are mammal bone.

Flesher. The only flesher recovered is made from a deer metapodial. The articular surface of the distal epiphysis has been cut or abraded to produce a flat face instead of the natural rounded end (Fig. 20h), exposing the cancellous bone. This end of the tool may have functioned as a "grainer" to sandpaper and soften a hide (Hodge 1907:592).

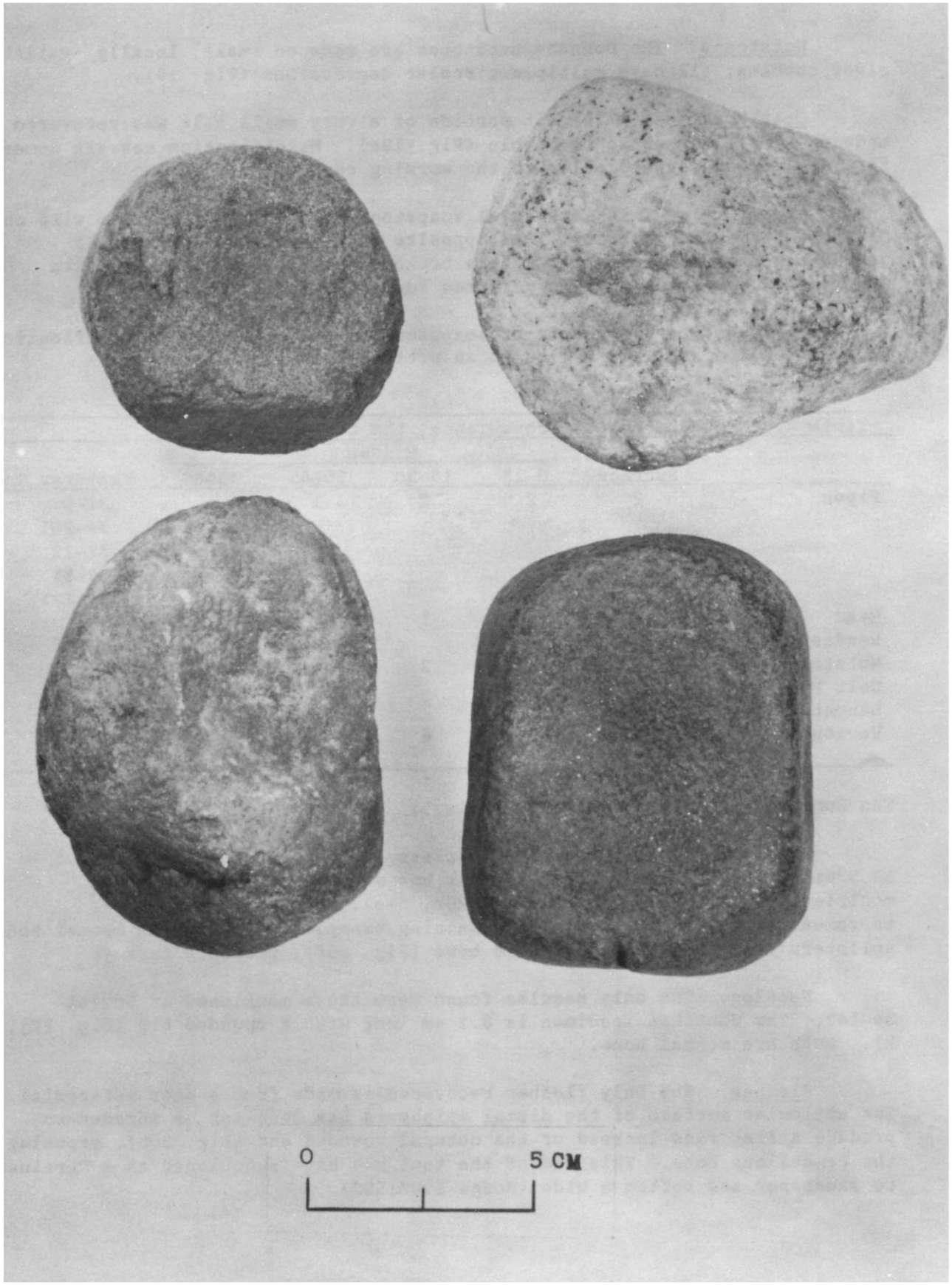


Figure 19. Nutstones from the Donnaha Site.

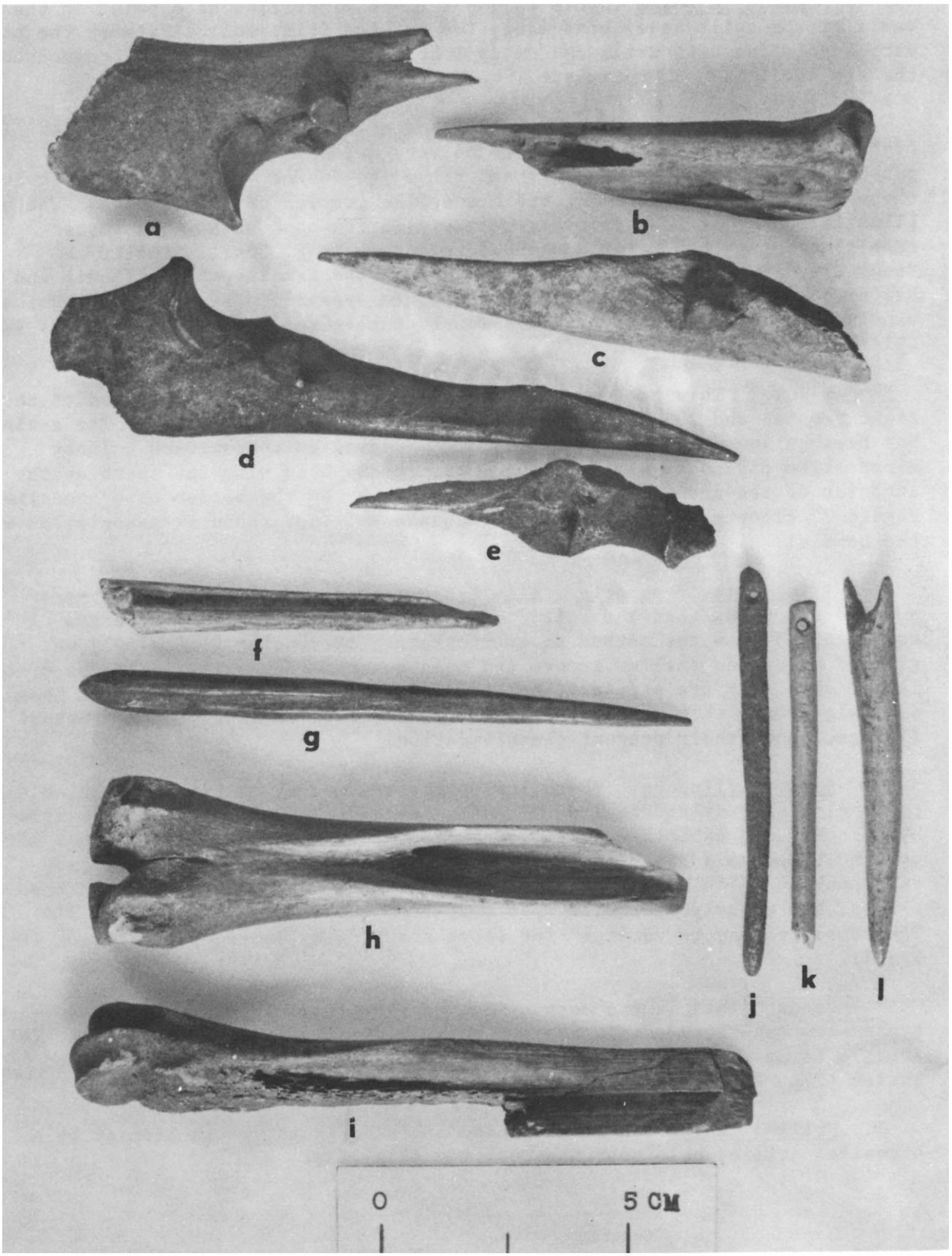


Figure 20. Bone and antler tools from the Donnaha Site include awls (a-g); flesher (h); chisel (i); needles (j,k); and a projectile point (1).

Projectile Point. This unique tool is classified as a point on the basis of its split base, presumably for hafting (Fig. 20l). Between the basal ears a hole has been drilled 3 mm up into the bone, probably to accommodate the tip of a shaft or foreshaft.

Fishhooks. Cut from a single piece of bone, the single complete fishhook is unbarbed and appears to be very delicate (Fig. 21b, c). A protuberance at the top of the shank served to secure the line. Very likely these were manufactured using the blade-like portion of a deer ulna. The ulna illustrated in Fig. 20a probably served as a fishhook blank, the longer remaining prong then being converted to an awl (Fig. 20a). Similar "recycling" of fishhook blanks is present in the Eva assemblage (Lewis and Lewis 1961:84 and Plate 37m), and the forked appearance seen in the Donnaha ulna awl is duplicated in fishhook manufacturing residue at Indian Knoll (Webb 1974:289 and Figure 45c).

Handle. This tool was made from a deer skull using a portion of the right frontal and 2-3 cm of the attached antler beam (Fig. 21d). The antler has been hollowed to a depth of 1.8 cm. Judging by the extreme, almost mirror-like polish on parts of the tool, it was held with the thumb on the interior of the frontal bone and the forefinger on the antler base opposite. Figure 22 illustrates this, using a Donnaha awl (not found in association with the handle).

Tines, tine fragments. All 16 have unmodified pointed ends, more rounded and blunt than the awls. Several of the smaller specimens are complete and show the method of manufacture: the antler tine simply was girdled by a wide shallow groove and then snapped (Fig. 21e-i). Three of the larger specimens are partially hollowed (Fig. 21n), and may represent handles for awls. None show damage to the distal tip such as is found on pressure flakers, hence their present classification.

Antler Cylinders. These implements are medial sections of antler 4-5.5 cm long, either cylindrical or slightly tapered. They have been made straight by scraping and exhibit evidence of battering on one end. One specimen has been hollowed to a depth of 8 mm and partially split (Fig. 21m), and may represent an unfinished antler point; its surface is more uneven than the others, and closely resembles specimens from Indian Knoll (Webb 1974:310). The remainder may be "drifts" for stone knapping by indirect percussion (Fig. 21j-l).

Beads. This is the most common bone artifact found at Donnaha. Three types were manufactured: a small tubular bead usually of cut bird bone (Fig. 23b); a large tubular bead either of bird bone or, in two cases, drilled antler (Fig. 23c, d, f); and a large round bead (Fig. 23e).

Drilled Canine. A lower canine tooth of Canis sp. is pierced by a biconical drilled hole near the root tip (Fig. 23a).

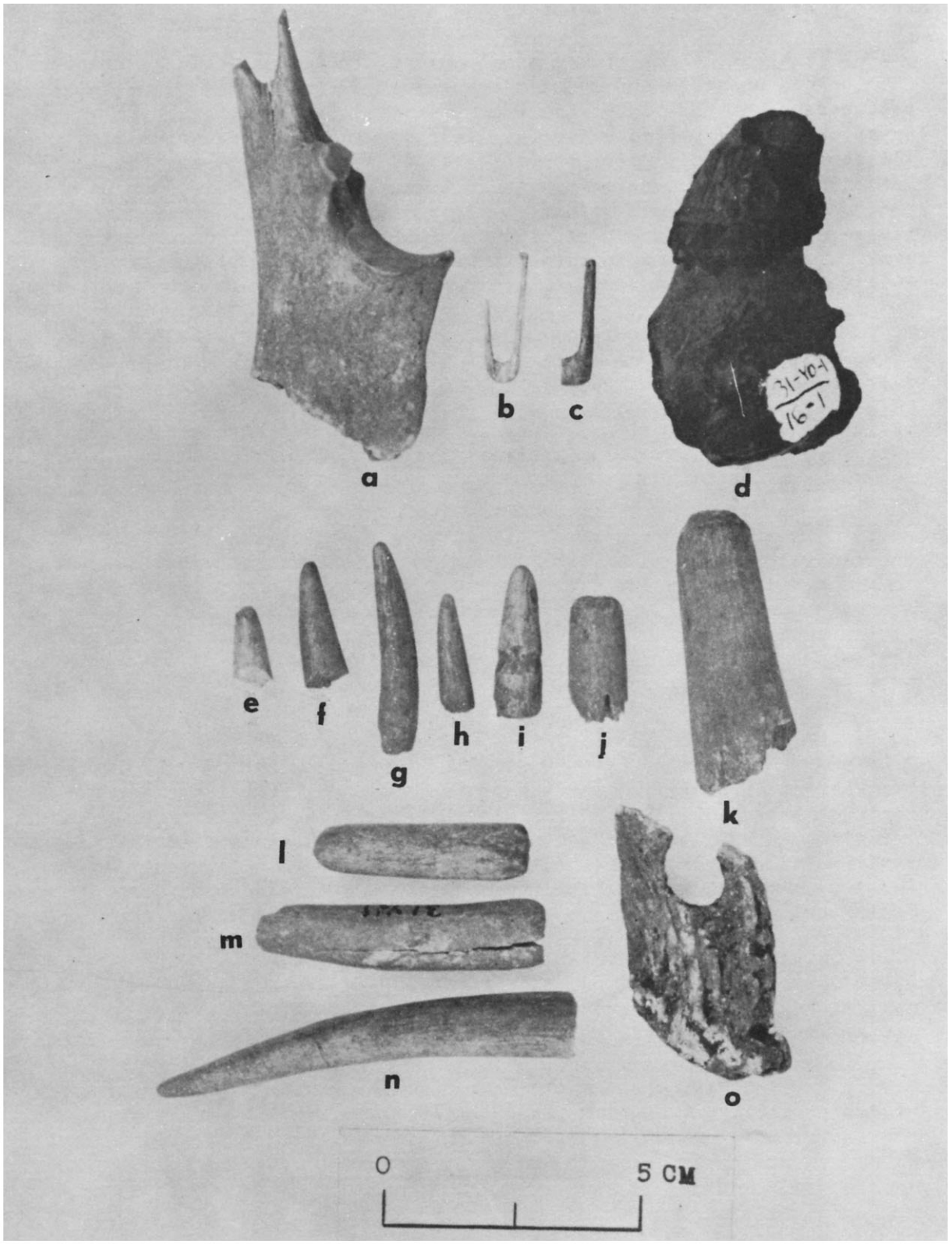


Figure 21. Bone and antler tools from the Donnaha Site also include deer ulna fishhook blank (or awl) (a); fishhooks (b,c); awl handle (d); tines (e-i, n); cylinders (j-m); and drilled antler (o).

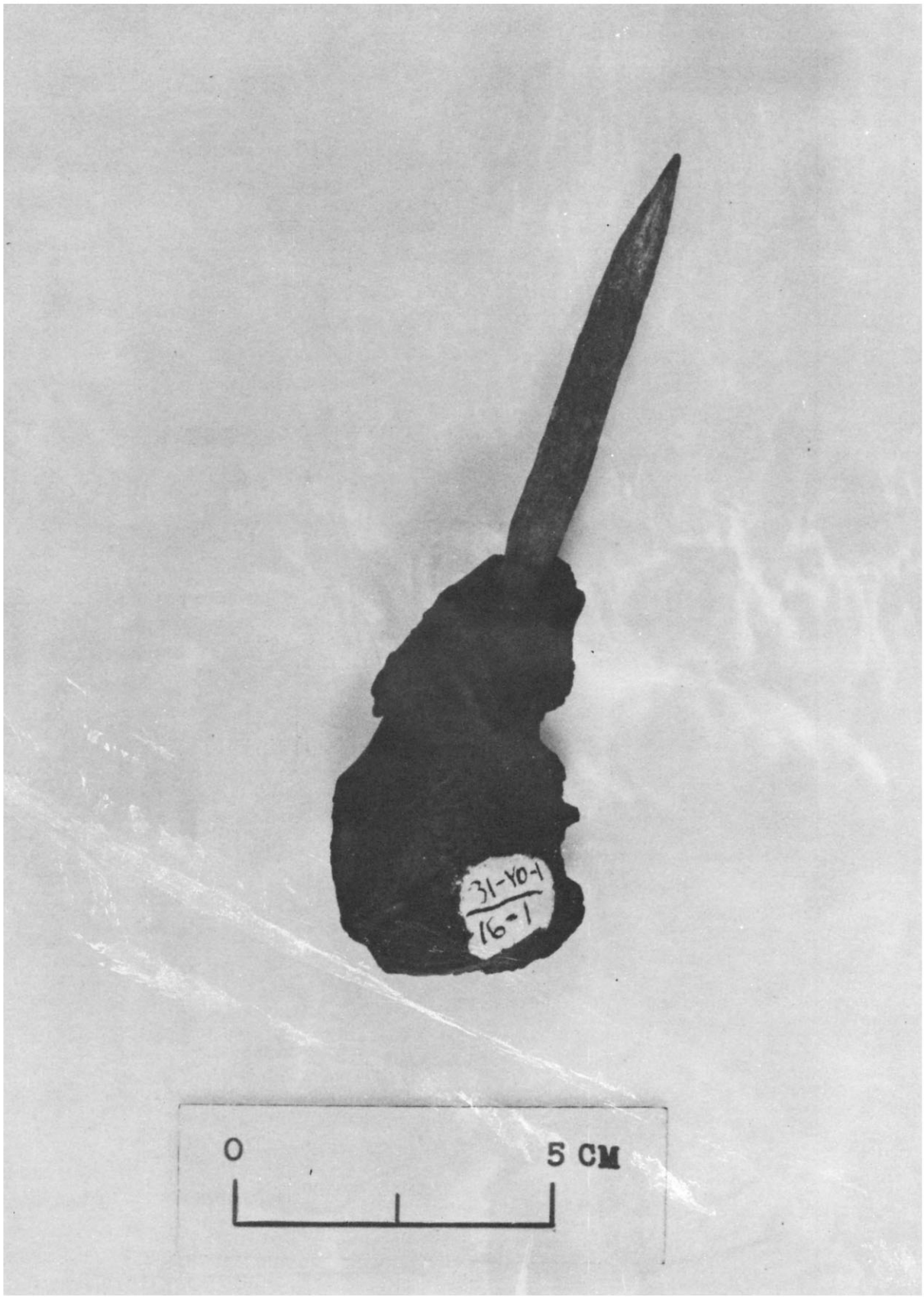


Figure 22. Awl and awl handle from the Donnaha Site. (Note: these artifacts were not found in association).

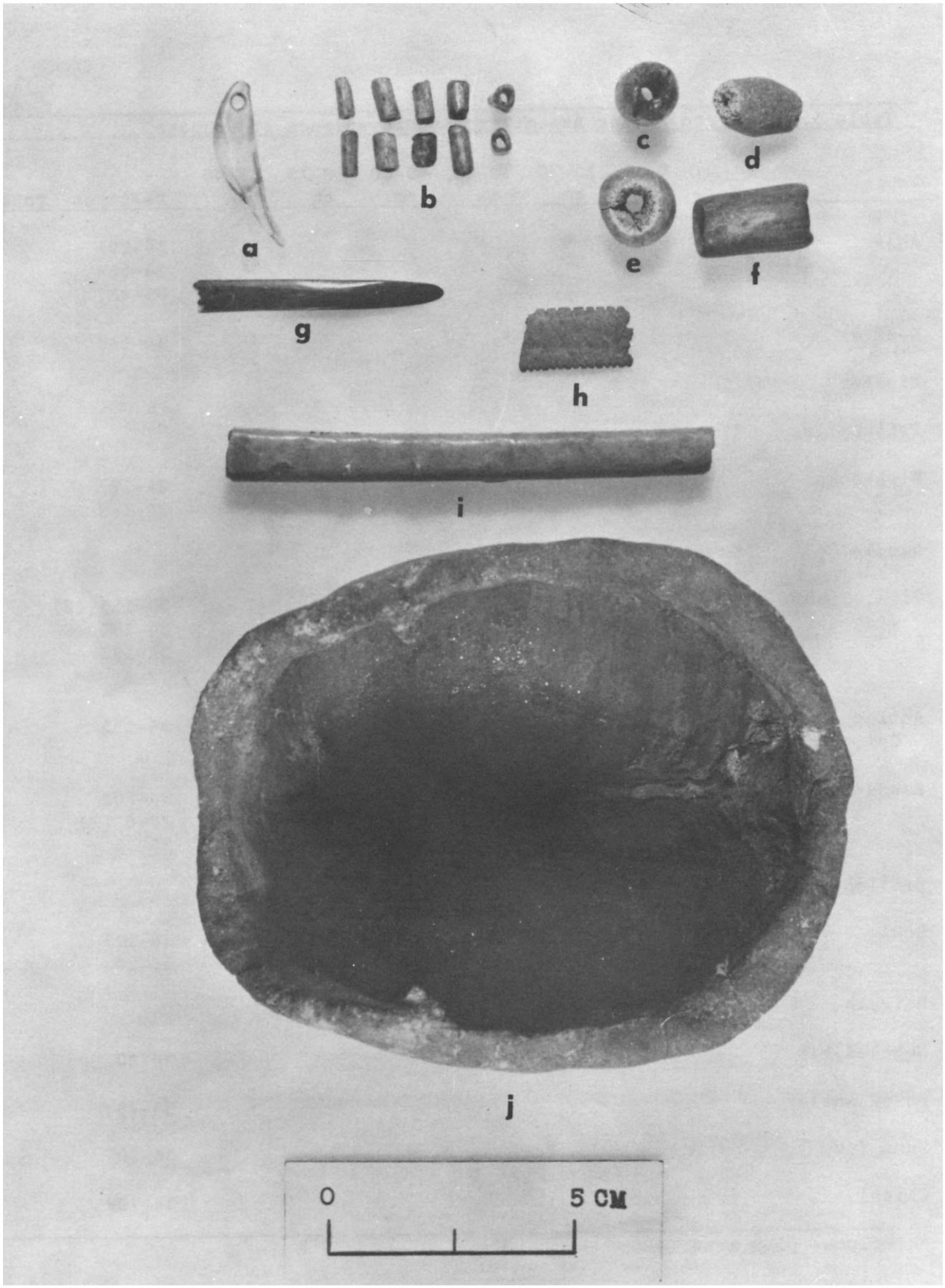


Figure 23. Bone artifacts from the Donnaha site, including a drilled canine tooth (a); beads (b-f); hairpin (g) notched rib (h); bone tube (i); and turtle shell bowl (j).

Table 5. Bone and Antler Assemblage by Provenience at Donnaha

	Surface	0-15 cm	15-30 cm	30-45 cm	45-60 cm	60-75 cm	75-90 cm	Features	Total
Awls	4	3	9	4				34-201 34-56 34-137	23
Needles								34-143 (2)	2
Flesher				1					1
Projectile	1								
Fishhooks								34-127 34-143	2
Handle	1								1
Tine, Tine Fragments	1	3	4	1	1	1		34-155 (2) 34-137 34-135 18-9	16
Antler Cylinder	1			3				34-155	5
Beads	4	3	1		1			34-201 22-6 (2) 34-75	23
Drilled Tooth		1							
Bowls		2		1				34-109 36-20	5
Hairpin	1								1
Notched Rib								36-20	1
Holed Antler								34-78	1
Bone Tube								36-20	1
Chisel								34-109	1

* Includes plow zone

Bowls. Bowls were made from the carapace of the American box turtle (Terrapene carolina) by the simple expedient of removing the vertebra and ribs fused to the inner carapace surface. No other modification was observed (Fig. 23j).

Hairpin (?). This is a fragment of very thin and highly polished bone with a rounded tip. The piece is slightly curved, apparently cut from the tabulum of a deer rib. The lustrous surface, symmetry and fragility suggest use as a hairpin or body ornament (Fig. 22g).

Notched Rib. Unfortunately broken at both ends, this artifact consists of a 2.3 cm section of deer rib delicately and regularly notched on both edges (Fig. 23h). The notches are differentially spaced on the two edges, and are far too small for the item to be used as a rasp. Three oblique engraved parallel lines join the edges on the convex side. Two more parallel lines can be seen near the break set at an acute angle to the first set, probably forming a chevron on the original. Again an ornamental function seems most likely. A similar item is illustrated from the Eva Site (Lewis and Lewis 1961:89).

Holed Antler. A basal section of antler has been split longitudinally and a hole 1.1 cm in diameter drilled from both surfaces. This may be a broken shaft wrench (Fig. 21o).

Chisel (?). A deer metatarsal has been cut obliquely so as to remove half the diaphysis and the proximal epiphysis. The rounded bit shows slight wear (Fig. 20i).

Bone Tube. A medial section of ulna, probably from a black vulture, cut on both ends and well-polished, measures 9.2 cm long and 1 cm in diameter (Fig. 23i). The medullary cavity has been scraped, producing a slightly curved tube.

Ceramics

As stated previously, an analysis of the Donnaha ceramic assemblage is the subject of a master's thesis currently in preparation, and a previous thesis (Barnett 1978) analyzed and seriated sherds from 20 sites in the Great Bend area, including those of two Donnaha trash pits. For this report I intend to provide only a general overview of Donnaha ceramic variability.

The ceramic data are ordered using Coe's types (Coe 1951, 1952, 1964. Claggett and Cable 1982:148-154), inasmuch as the utility of these has been demonstrated for the Great Bend area (Barnett 1978:92) as well as elsewhere in the Piedmont. Despite the general applicability of the system it, like any taxonomic system based on a normative view of cultural phenomena, cannot accommodate the full range of variability present in a single site assemblage. The detection of intrasite patterning of ceramic attributes, particularly those which may monitor variation in function and/or social units, awaits a more comprehensive study of the artifact class. For

descriptive purposes this report focuses on two attribute sets--surface treatment and paste--inasmuch as these appear most useful for establishing the temporal relationships of Donnaha to other Piedmont Woodland sites (Claggett and Cable 1982). In addition the several reconstructable vessels will be described.

Samples for analysis were drawn from the E.U. 34 and E.U. 16 area, and E.U. 18, since these were in the thickest portion of the midden and were most likely to reflect attribute changes through time. The contents of features were excluded from the stratigraphic analysis because the aboriginal excavation of these features doubtless produced a degree of mixing which could not be detected and corrected. Elimination of this mixing probably would produce a clearer view of ceramic change at the site, but no excavation units in the midden were without aboriginal pits.

The Donnaha sherds generally fall within the Uwharrie-Dan River series (Coe 1952, Coe & Lewis 1952), particularly in regard to the fabric of the vessels, i.e. their paste and non-plastic inclusions. Yadkin series sherds (Coe 1964), while present, are a minor element in the assemblage. Published dates for the Uwharrie-Dan River series fall between A.D. 1200-1700, a period which includes three of the Donnaha C-14 samples.

For analysis sherds initially were sorted on the basis of fabric attributes. This was done for two reasons: first was the success achieved by Snavely and Raber in their study of ceramics from the Haw River excavations reported by Claggett and Cable (1982); secondly, even a cursory study of the Donnaha sherds revealed that fabric attributes were directional in their variability, with the medium to large crushed quartz inclusions yielding to finer sand in the upper portion of the midden. For purposes of this analysis samples were chosen from the E.U. 16 area, the E.U. 34 area, and the E.U. 18 square. A total of 3,241 sherds were examined, with an initial sorting carried out on the basis of non-plastic inclusions and paste characteristics. This resulted in four major groupings which correspond--in regard to fabric features--to three recognized ceramic series. A fourth category has affinities to both Uwharrie and Dan River series.

Yadkin Series. This is a minor ware at Donnaha, occurring primarily near the bottom of the midden. The paste is well-mixed and contains large amounts of hematite grit, medium to fine sand and crushed gneiss and quartz, usually all appearing in each sherd in varying proportions. Surfaces are tan to yellow-orange, and the feldspar of the gneiss often speckles the surfaces with white.

Uwharrie Series. This pottery dominates the lower portion of the midden, and is marked by abundant fragments of crushed quartz added to the paste. Usually both surfaces are dark gray or black. The paste is poorly mixed as revealed by a "laminated" or layered appearance of the sherd core, a clumping of the non-plastic inclusions, and occasional voids or pores. The paste also contains varying amounts of fine sand, probably a natural constituent of the clays, which produce a gritty texture on those vessel interiors which are unsmoothed.

Dan River Series. The major ceramic of the later Donnaha occupation, this ware largely replaces the Uwharrie pottery in the upper portion of the midden. Dan River pottery may contain both crushed quartz and river sand in varying proportions (Coe and Lewis 1952), and at Donnaha those proportions change through time. In the lower levels of the midden most sherds exhibit at least some crushed quartz, but this agent declines until, by the upper levels, sand alone is the most common inclusion. The paste shows less change from the Uwharrie, remaining poorly mixed but with fewer voids. Sherd thickness decreases slightly, but less than a dozen specimens resemble the well-smoothed, hard plain ware of Upper Sauratown (Gardner 1980).

Uwharrie-Dan River. These sherds contain fine to medium (1-2 mm) sand particles, with occasional fragments of crushed quartz. Like the Uwharrie specimens, the paste is poorly mixed and shows voids and laminations, but the surface treatment shows a higher frequency of net-impressing than observed on the Uwharrie specimens proper.

Beads. The ceramic beads are tubular and spherical, 9 to 15 mm in length. These are rare at Donnaha.

Pipes. Like beads, clay pipe fragments were scarce--only three identified pieces were recovered (Table 6). The two stem fragments are round in cross-section, while the third and largest piece includes a bowl set on an oblique (140 degree) angle to the stem. No decoration is present on any.

Table 6. Ceramic Beads, Pipes by Provenience, Donnaha Site

	Surface	0-15	15-30	30-45	45-60	60-75	Feature	Total
Beads	1	1					34-135	3
Pipes	1	1			1			3

Reconstructable Vessels. In a few instances the excavations encountered "pot busts", i.e. concentrations of sherds which could be fitted to reconstruct large sections of single vessels. No doubt additional vessels will be reconstructed with the more detailed ceramic analysis in preparation.

Uwharrie Net-Impressed (Fig. 24). This vessel is decorated by sets of four parallel lines obliquely incised around the shoulder. The neck is slightly constricted and the rim is vertical with a simple rounded lip. The exterior surface has been impressed by a 5 mm mesh net, lightly smoothed on the rim. The interior surface shows striations left by scraping and smoothing. The base (not illustrated) is conoidal.

Unfortunately the basal and upper sections cannot be articulated, but the original height was at least 32 cm, with an orifice ca. 41 cm in diameter. This vessel was found in feature 34-135, in association with

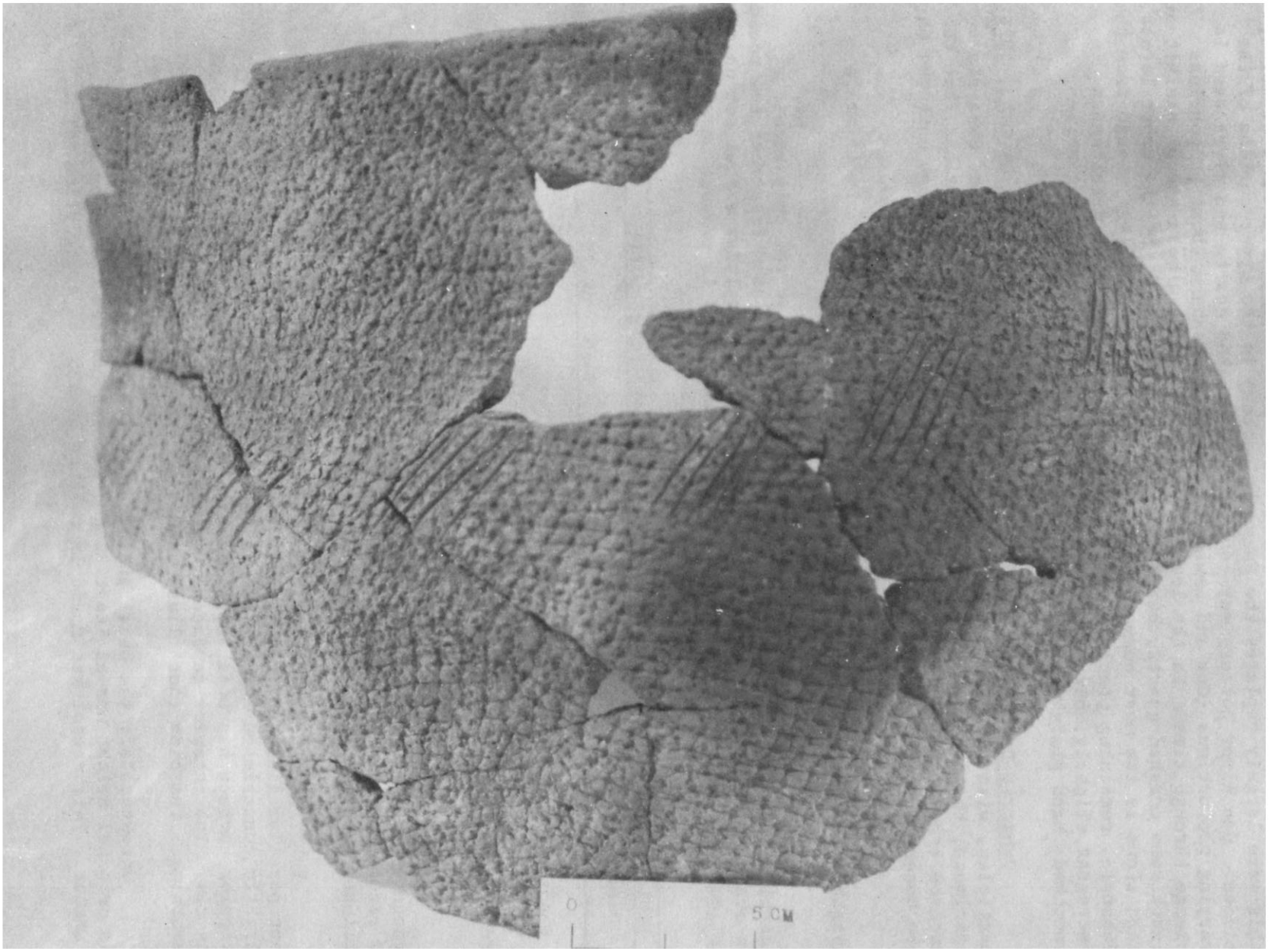


Figure 24. Uwharrie Net-impressed vessel portion from trash pit 34-135, Donnaha Site.

numerous large pieces of charcoal which yielded a C-14 date of 470 ± 70, or A.D. 1480 ± 70.

Dan River (Fig. 25) Unlike the Uwharrie vessel, this specimen exhibits an interior surface carefully smoothed. The exterior has been smoothed and then incised below the rim with a denticulate tool to produce a pattern of irregular diamonds The rim is short and flaring, the lip rounded. An unarticulated basal sherd indicates the bottom was gently rounded. Projected vessel height is 17 cm; the mouth is 18 cm in diameter, and the volume is estimated as about 3 liters. This vessel occurred in midden soil, 10-25 cm below the plow zone, in E.U. 37.

Dan River Net-Impressed (Fig. 26). Represented only by a large portion of the vessel shoulder and rim, this specimen has a scraped, then smoothed interior. The rim is short and everted, with the lip notched along its exterior. The diameter is 25 cm. This vessel segment occurred in the filled erosional feature described for the E.U. 13 unit, 78-98 cm below the plow zone.

As shown below, the Donnaha midden reveals a trend in ceramic production away from the inclusion of crushed quartz in the fabric, toward the use of fine to medium sand. Similarly a trend in surface treatment is noted, from cord-marking toward net-impressing. Nor are these variables independent; as shown by Table 7, a chi square computation for E.U. 34, 0-15 cm below plow zone, net-impressing co-occurs with the Dan River fabric:

Table 7. Ceramic Paste by Surface Treatment, the Donnaha Site

	Cord-Marked		Net-Impressed		
crushed quartz inclusion (Uwharrie fabric)	0/16	E/(12)	0: 0/15	E/(19)	31
fine sand inclusions (Dan River fabric)	0/29	E/(31)	0: 0/50	E/(48)	79
fine sand with crushed quartz (Dan River fabric)	0/21	E/(23)	0: 0/37	E/(35)	58
	66		102		168

$X^2 = 2.66$
p .05

Table 8 shows the tendency at 15-30 cm in the same square N577, W588:

Table 8. Ceramic Paste by Surface Treatment, the Donnaha Site

	Cord-Marked		Net-Impressed		
crushed quartz inclusion (Uwharrie fabric)	0/159	E/(138)	0: 0/78	E/(99)	237
fine sand inclusions (Dan River fabric)	0/34	E/(45)	0: 0/44	E/(33)	78
fine sand with crushed quartz (Dan River fabric)	0/87	E/(97)	0: 0/79	E/(69)	166
	280		201		481

$X^2 = 16.49$
p .05

Figure 25. Dan River incised vessel from E.U. 37 at the Donnaha Site.

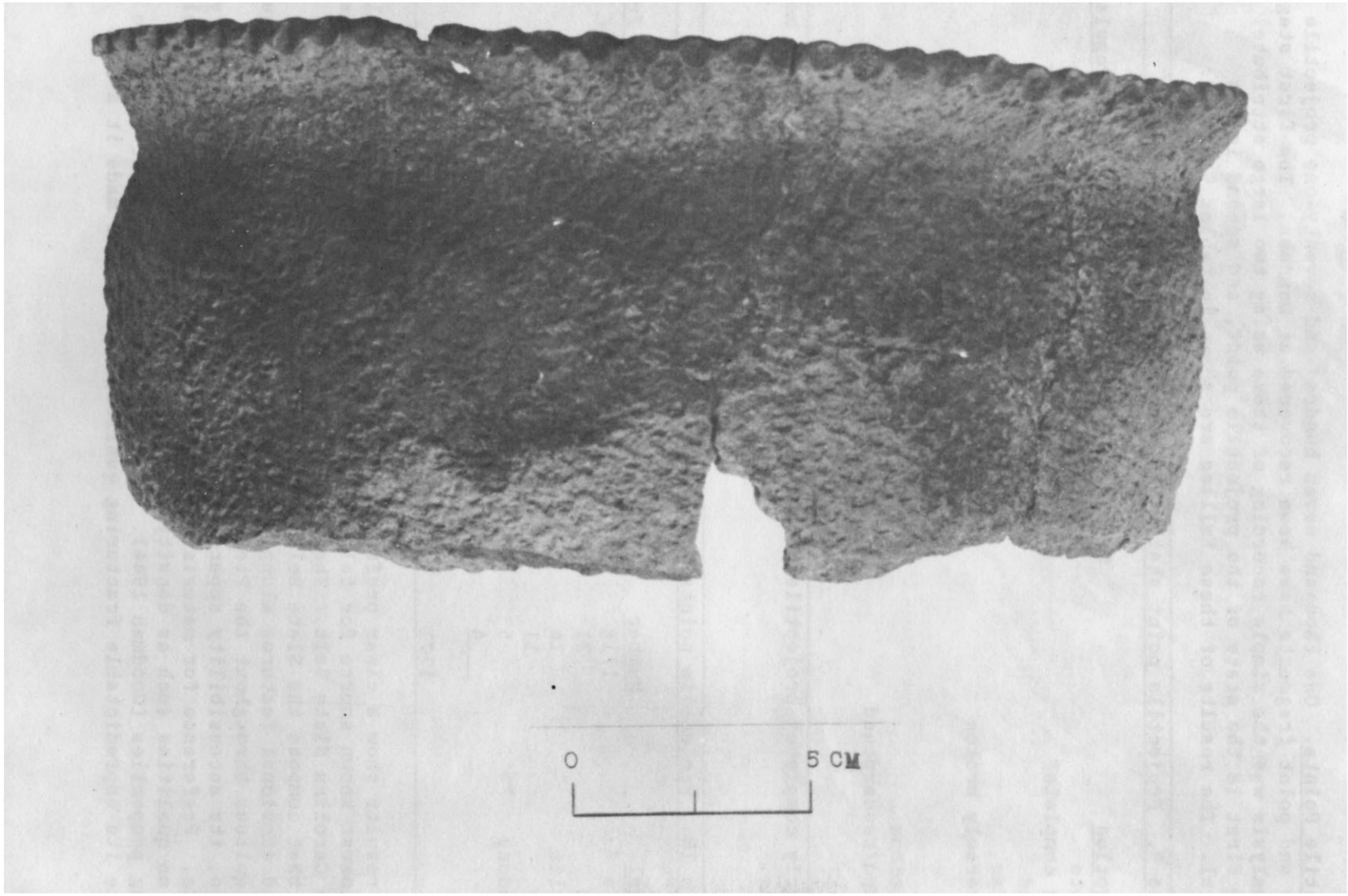


Figure 26. Dan River Net-impressed rim sherds from E.U. 13 at the Donnaha Site.

Chipped Stone Assemblage (by Lisa Eppley)

Projectile Points. One thousand seven hundred and seventy-one projectile points and point fragments have been recovered at Donnaha. The first stage in the analysis was the simple recording of these using two large attribute sets: first is the state of the projectile point, and second is raw material. The results of these tallies are shown in tables 9 and 10.

Table 9. Projectile point state, the Donnaha Site

Description	Number	% of Point Population
complete	268	15
nearly complete*	642	36
aborted	85	5
preforms	36	2
transversely broken	126	7
bases	177	10
tips	350	20
midsections	54	3
reworked/resharpened	33	2
TOTAL	1771	100%

* "Nearly complete" projectile points refer to points which have one or more corners.

Table 10. Projectile points raw material, the Donnaha Site

Material	Number	Percent	Number Heat Treated
felsite	1714	96	5
quartz	21	1	
argillite	16	1	
jasper	11	1	5
chalcedony	5	.3	
chert	4	.2	1
TOTAL	1771	99.5	11

These results show a clear preference for felsite, a nonlocal raw material. The closest known source for felsite is approximately 70 km to the southeast in the Carolina Slate Belt. The wide variety of volcanic and sedimentary rocks that compose the Slate Belt are readily accessible in the form of exposed erosional features along hill sides and stream banks. Although quartz is ubiquitous throughout the Piedmont, occurring in veins just below the surface, its accessibility apparently did not outweigh the greater utility of felsite. Preference for materials to be used in the manufacturing of tools is based on qualities such as density, hardness, resiliency, toughness, and flaking properties (Goodman 1944). Although quartz is a harder substance than felsite its unpredictable fracturing qualities would have made it a less

desirable source for manufacturing the small projectile points. Mechanisms that would make a nonlocal source available are trading networks, or less likely, a catchment that incorporated the source area. Traveling 140 km for the express purpose of acquiring raw material for tools is unlikely (Binford n.d.).

The relatively rare occurrence of jasper and chalcedony at the site is perplexing. Jasper and chalcedony both occur naturally in an area around Sauratown, North Carolina, about 25 km northeast of Donnaha. These materials have isotropic properties, a glassy quality, the consequences of which are predictable conchoidal fracturing and extremely sharp cutting edges (Semenov 1973). While preference for these materials would be expected, availability apparently was limited. The chert present at Donnaha is Knox chert, found in the Ridge and Valley area of Tennessee and Virginia. Acquisition of chert was apparently infrequent and may reflect only isolated incidents, not an established trading or procurement system.

After counts of the two physical categories, the next stage of analysis was the search for patterns. One question asked of the data on the "state" of projectile points involved discard behavior; that is, were the projectile points and point fragments being differentially discarded throughout the site? It was hypothesized that the ratio of complete to broken projectile points in the midden differs from the ratio in trash pits. A Mann-Whitney U test was used to test the null hypothesis that the two populations are identical. The ratio of complete to broken points was calculated for ten trash pits and compared to the ratio of complete to broken points in the midden zone immediately surrounding the pits. The result of the analysis ($U=68$, $Z=1.88$, $a=.05$) indicate that there is no statistical difference between the two.

Concerning raw material counts, an attempt was made to determine whether use and/or accessibility of certain exotic materials varied through time. Jasper was found throughout all levels of the site with no concentration in any single zone. Sixty percent (60%) of the chalcedony was found in the plow zone. The remaining 40% was in features such as pits or post holes. Twenty-five percent (25%) of the chert was found in the plow zone, 50% in the level immediately below the plow zone, and the single remaining specimen was located in a pit. Conclusions drawn from such a small sample would be tentative at best, but there may have been a trend towards greater exploitation of the northern lithic sources during the later period of occupation.

A detailed analysis was conducted on the complete projectile points. Nine variables were recorded and coded for each point. The variables included length, width, "bifacial success", unifacial, base shape, side shape, raw materials, serration, and flake scar. Bifacial success (coded yes or no) records those points which had flakes evenly removed from both sides. A typical bifacially successful point is lenticular in cross section with the flake scars creating a medial ridge extending the length of the point on both faces. "Unifacial" includes points that either had flakes removed only from

one side or had only been marginally retouched. Bases and sides were evaluated according to whether they were straight, incurvate, excurvate, or, in the case of some sides, had a combinant form. Raw material was broken down into fine grain felsite, coarse grain felsite, exotic (jasper, chalcedony, and chert), and quartz. The distinction between fine and coarse grain felsite corresponds to grain sizes of less than or greater than .75 mm (Jones 1979). Macroscopically this distinction was made on the basis of an evaluation of texture. Felsite categorized as fine grain has a waxy or smooth appearance, while coarse grain felsite has a rough, grainy look and feel, often with large phenocryst inclusions. Serrations were either present or absent. The variable "flake scar" refers to the presence or absence of a patinated flake scar on a more recently modified point.

Using the Biomedical Computer Program, P1F, two-way frequency tables were constructed to measure the degree of association between the variables. To summarize a few of the more interesting results: first, raw material and bifacial success were highly correlated ($p \leq .001$). Sixty-four percent (64%) of the fine grain felsite points were successfully bifacially worked whereas only 31% of coarse grain felsite points were successful bifaces. Second, the high correlation of raw material and serrations ($p \leq .01$) appears to be the result of greater use of serrations on points made from fine grain felsite (16%) and exotic materials (22%) as compared with the coarse grain felsite (only 2% serrated) and quartz (none serrated). A final observation is the high correlation ($p \leq .001$) of flake scars to length and width. There is a definite tendency for the occurrence of patinated flake scars to decline as both width and length increase. This would support the contention that points exhibiting old flake scars are being recycled, resulting in their smaller size.

Although this approach was helpful in a descriptive sense, the measures of association did not reflect any of the stylistic relationships used in traditional typologies. For example, point shape was not highly correlated to attributes such as length, width, or serrations.

The basic typological point sequence for the Carolina Piedmont is outlined in Joffre Coe's Formative Cultures of the Carolina Piedmont (1964). Relying heavily on information provided in that publication and on several more recent studies conducted in the Piedmont (Claggett and Cable 1982; Spielman 1976) the complete projectile points from Donnaha were assigned to particular types. The criteria for type classification were raw material, general outline, size, and flaking techniques. Each of the major types will be discussed separately. The Archaic points, which are very few in number, will be discussed as a group.

Archaic. There is a small Late Archaic component at Donnaha. Evidence for this is one nearly complete Savannah River point, 94 mm long and 40 mm wide (Fig. 27j) and one complete, heavily patinated point (Fig. 27a) which resembles a Savannah River stemmed variant (Spielman 1976). In addition to this point, four bases and two tips of what appear to be Savannah River points were found. All are made of a very coarse, large grain felsite not found among the Woodland points. Although broad blade Savannah River points are

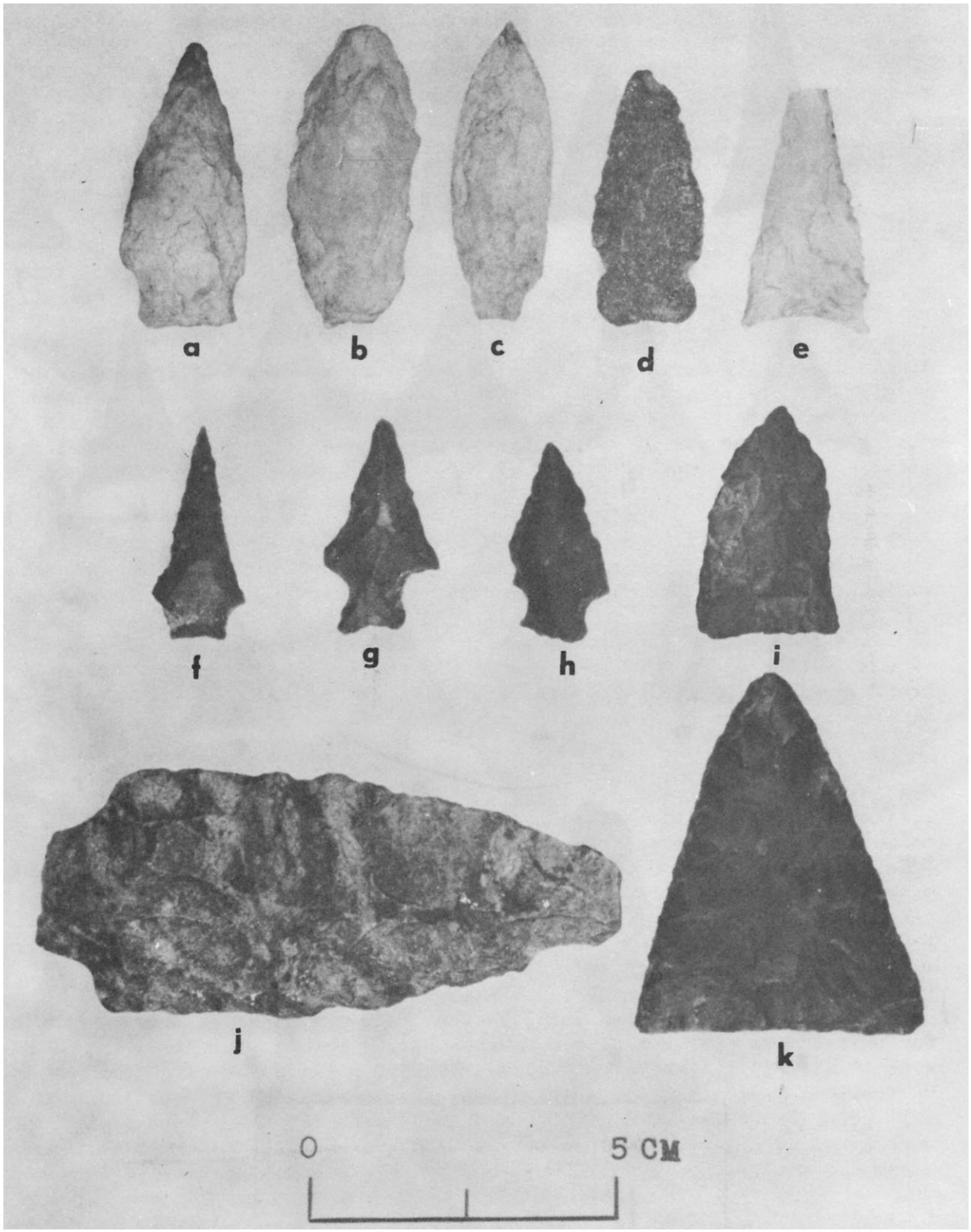


Figure 27. Projectile points from the Donnaha Site: archaic (a,j); miscellaneous types (b-d, f-h, k); Yadkin (e); and Badin (i).

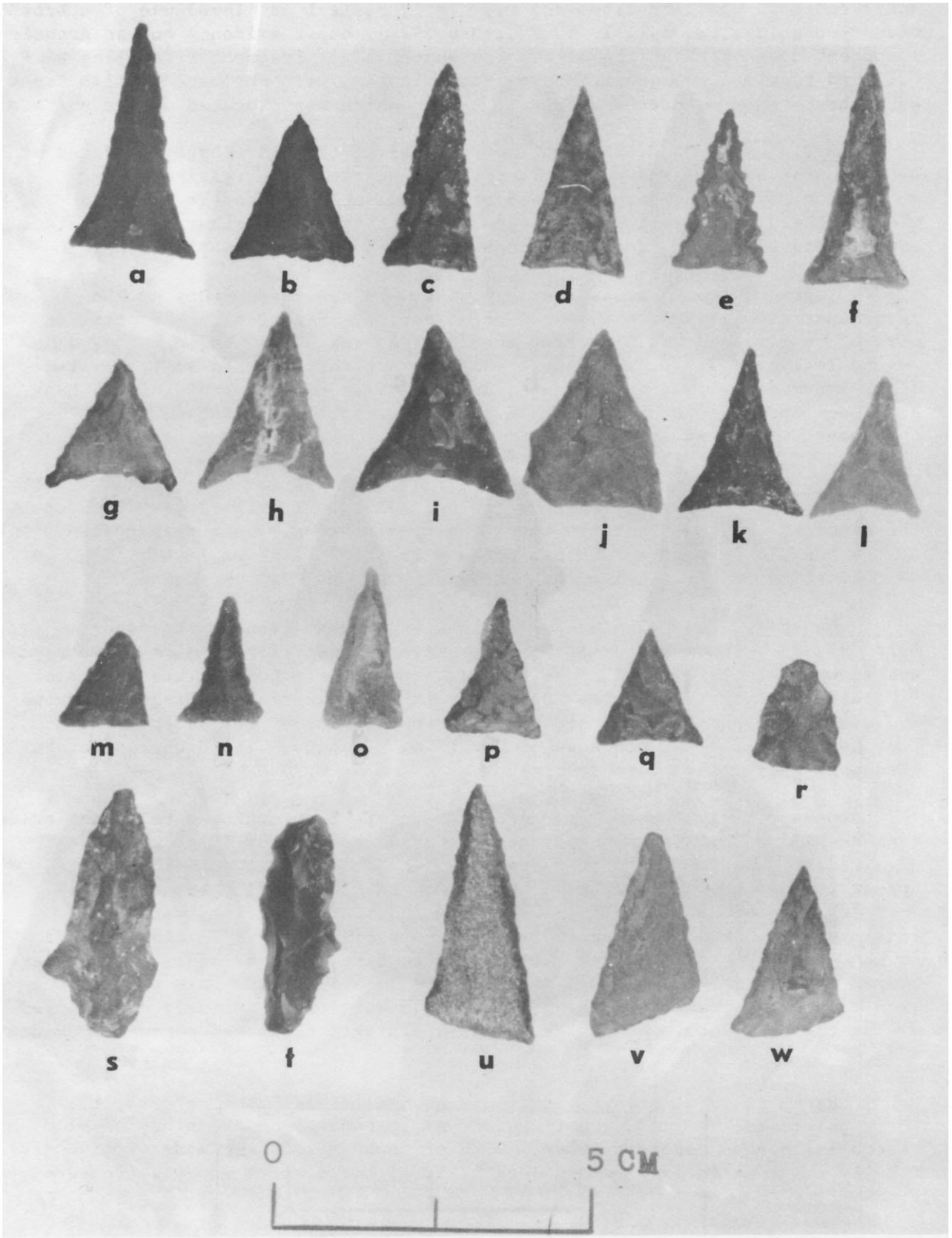


Figure 28. Projectile points from the Donnaha Site: Uwharrie (a-f); Pee Dee (g-l); Caraway (m-r); Randolph (s,t); and miscellaneous types (u-w).

often found at Woodland sites and may simply reflect continued use of a broad blade technology (Woodall 1975, Stoltman 1972), other evidence for an Archaic component does exist at the site. One quartz blade fragment resembling a Guilford type and one quartz Morrow Mountain base were recovered. Also found were three reworked Morrow Mountain, two of which were located on the surface.

Badin. Only a single specimen resembling the Badin type was found at Donnaha (Fig. 27i). The point is made from coarse grain felsite using percussion flaking. The point measures 38 mm in length and is 24 mm in width. There is no evidence of wear or smoothing along either of the lateral edges. The point was found at a depth of 46 to 60 cm below plow zone.

Yadkin. Two possible Yadkin points were recovered. One of the specimens resembles Coe's atypical eared variety (Fig. 26e). The point is made of felsite and exhibits fine pressure flaking along the edges. The second Yadkin point is made from a coarse grain felsite, has an incurvate base, excurvate sides, and measures 33 mm x 99 mm. The corners of the base have been worked in such a way that "ears" are subtly suggested. Both specimens were found in the plow zone.

Pee Dee. Forty-nine points were identified as Pee Dee Triangular (Fig. 27g-i, k, l) and one specimen as a Pee Dee Pentagonal (Fig. 27j). Data on these points is shown in Table One. Two specimens have been resharpened. One of the Pee Dee Triangular exhibiting heat treating is shown in Fig. 27g. A discoloration of the felsite can be seen across the base of the point.

Uwharrie. One hundred four points were identified as the Uwharrie type (Fig. 27a-f). The measurements and raw material distributions of these points are shown in Table 11. Only one was resharpened. In general the Uwharrie type differs from the Pee Dee Triangular in that Uwharrie is larger, narrower and more often has straight sides and bases. Choice of raw material does not vary between the types nor does method of manufacture. The Uwharrie points also were made using pressure flaking.

Caraway. The third large group of points that conforms to a particular type are 72 small triangular points identified as Caraway (Fig. 28m-r). The significant data for the points are shown in Table 11. Two of the points appear to have been resharpened. There may be some overlap between this category and the Uwharrie types, but as a rule Caraway points were distinguished from the Uwharrie type on the basis of their smaller size, a slight narrowing of the point just above the base, an equilateral triangular shape, and generally less well made appearance. Although these points were also made using pressure flaking, the flakes were often unevenly distributed across the point and, in some cases, only a single flake was removed from one side.

Randolph. Two points correspond to Coe's Randolph (Fig. 28s, t). These points are thick, narrow, crudely made, and have rudimentary stems resembling Morrow Mountain types. Both of these points are made of fine grain felsite. One measures 32 mm in length and 11 mm in width and was recovered in

Table 11. Projectile point data for Uwharrie, Pee Dee, and Caraway projectile points at the Donnaha Site.

Uwharrie points
Length range: (9 - 42 mm, mean 26.4)
Width range: (11 - 24 mm, mean 17.0)
Average length to width ratio: 1.55
Raw material percentages:

Fine grain felsite	56%
Coarse grain felsite	42%
Jasper	1%
Chalcedony	1%

General Shape:	Base	Sides
straight	67%	68%
incurvate	32%	23%
excurvate	1%	5%
combination		4%
serrated	12%	
flake scars	8%	

Pee Dee points
Length range: (20 - 40 mm, mean 25.8)
Width range: (13 - 25 mm, mean 18.9)
Average length to width ratio: 1.37
Raw material percentages:

Fine grain felsite	54%
Coarse grain felsite	42%
Jasper	2%
Quartz	2%

General shape:	Base	Sides
straight	18%	32%
incurvate	82%	42%
excurvate		12%
combination		12%
serrated	3%	
flake scar	12%	

Caraway Points
Length range: (13-29 mm, mean 20.1)
Width range: (10-20 mm, mean 13.9)
Length to width ratio: 1.145
Raw material percentages:

Fine grain felsite	44%
Coarse	43%
Jasper	6%
Chalcedony	3%
Chert	1%

General shape:	Base	Sides
straight	65%	58%
incurvate	30%	24%
excurvate	4%	7%
combination		11%
serrated	8%	
flake scar	14%	

the plow zone. The remaining point measures 34 x 10 mm and was found at a depth of 30 to 46 cm below plow zone.

Miscellaneous projectile points. Not surprisingly, quite a few of the projectile points recovered at Donnaha resisted classification using the traditional typology. These points will be described and similarities to known types will be noted.

One oval-shaped blade is placed in the miscellaneous category (Fig. 27b). The blade measures 48 mm in length and is 15 mm wide. Determination of the raw material used in manufacturing the point is difficult because it is heavily patinated. Large flakes have been irregularly removed from both sides of the point. One of the lateral edges has a smoothed appearance suggesting that the implement may have functioned as a knife instead of (or in addition to) a projectile point.

A group which could not be identified consists of three argillite points. Lengths ranged from 26 to 31 mm, widths from 19 to 21 mm. Two of the three points have incurvate bases, with sides incurvate and straight. The third point has both a straight base and straight sides. The points resemble the Yadkin type in shape; however, their small size and only slight indention across the base prevents this classification. The stratigraphic location of the points does not give any clue to their identify. Two were found on the surface. The third point was located in a feature.

A second group of points in the miscellaneous category are identified only as "Early Ceramic" points (Spielman 1976). Three of these have small triangular blades, are side notched, and are made of fine grain felsite (Fig. 27f-h). Lengths range from 32 to 35 mm and widths from 15 to 18 mm. One of these points was found at a depth of between 0 to 15 cm below the plow zone. The others were located between 30 to 60 cm below the plow zone. The remaining point classified as "Early Ceramic" is oval with a tapering base that forms a small stem (Fig. 27c). The point has been worked by percussion flaking with some pressure flaking along the lateral edges. It measures 48 mm in length and is 16 mm wide, and was located at a depth of between 15 to 20 cm below plow zone.

Two other stemmed points found at the site resemble Halifax points (Coe 1964); however, they are both made of coarse felsite instead of more characteristic quartz. One measures 33 mm in length, 18 mm across the blade, and 16 mm across the base. The point is side-notched and was made using percussion flaking. The second (Fig. 27d) is also side-notched, 41 mm long, 18 mm across the blade, and 16 mm across the base. The corners have been ground giving the base a rounded appearance. Both points were located at a depth of between 45 and 60 cm below the plow zone.

The largest group within the miscellaneous category is 25 marginally retouched or unifacial points that do not conform in shape to any known types (Fig. 28u-w). These were made exclusively of felsite, and 76% had old flake scars present. Over half of the bases (64%) and sides (52%) are straight. Lengths range from 16 to 39 mm, and widths vary from 10 to 23 mm. These

can be found in nearly all levels of the site but tend to be concentrated in the level just below the plow zone.

One of the most interesting points recovered at Donnaha is a large triangular specimen 58 mm long and 47 mm wide (Fig. 27k). It is made from very fine grain felsite with delicate pressure flaking along the edges. The sides and base are straight. The point was found at a depth of between 15 and 30 cm below plow zone in association with a large broken point, made of the same material, that resembles a Yadkin.

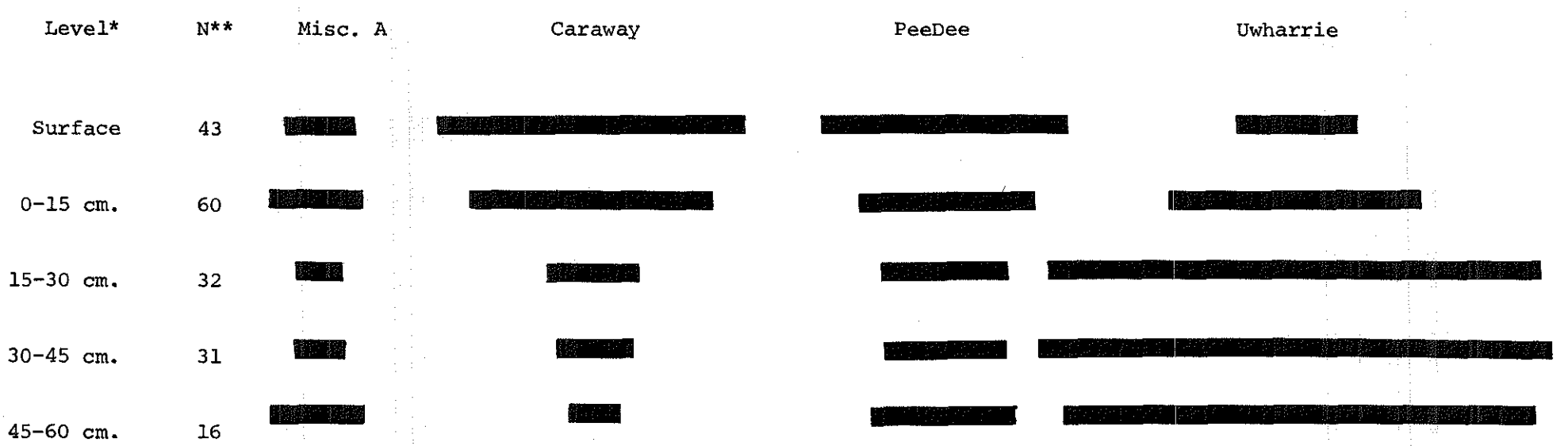
The stratigraphic distribution of the major point types is shown in Figure 29. As can be seen from the diagram, the Uwharrie type is fairly evenly distributed throughout the midden zones between 0-45 cm below plow zone with a slight peak at a depth of 15-30 cm below plow zone. The Uwharrie type very gradually begins to taper off at 0-15 cm below plow zone at which level the Pee Dee point type becomes prominent. The Caraway type becomes mixed with the Pee Dee in the upper levels and peaks at the surface. The miscellaneous group of points that are only marginally retouched (labeled as Misc. A in Figure 29) are scantily but persistently present in all levels. Coe (1964) notes that Pee Dee points are often carelessly made and may have old flake scars present, and the miscellaneous group may be related to the Pee Dee points. The distribution of point types across the midden zones indicates no temporal variation from one part of the site to the other.

Table 12. Horizontal projectile point distribution, the Donnaha Site

	Misc.	Caraway	Pee Dee	Uwharrie	Totals
North midden	1(1.5)	4(2.9)	2(2.8)	6(5.8)	13
South midden	10(9.5)	18(19)	19(18.2)	38(38.2)	85
TOTALS	11	22	21	44	98

$X^2 = .76$
critical value for d.f. a = .05 = 7.81
Yates correction = .18

Tools and Cores. A total of 369 tools (other than points) and cores have been recovered and analyzed. The type, number, and percentage of total tool population are shown in Table 13.



*Level below plow zone

**Excludes points from disturbed context and levels where N 1

Figure 29. Seriation of Woodland projectile points at the Donnaha Site (31Yd9).

Table 13. Tools and cores at the Donnaha Site.

Description	Number	% of Tool Population
biface fragments	28	8
gravers	14	4
cores	45	12
secondary cores	86	23
exhausted cores	9	2
drills	33	9
knives	5	1
retouched blades	4	1
retouched flakes	32	9
scrapers	105	28
miscellaneous tools		
core tool/biface	1	
graver/scraper	1	
scraper/notch	1	
notch	1	
double notch	2	
denticulates	2	
TOTALS	369	97%

Omitted from analysis are three gunflints (Fig. 30 a-c). All were surface finds or from disturbed contexts. Two of the specimens (30 a, b) are of nonlocal, possibly English flint; the other (Fig. 30c) is of white quartz and likely represents a locally made artifact.

The largest group within the tool category is scrapers (Fig. 30j-n). The majority of these are of felsite (76%) and over half are of the coarse grain variety. Eighteen percent (18%) are made of quartz, which is the highest percentage of quartz used for any tool type. Only 5% were made of jasper and chert. Eighteen of the scrapers were backed, either naturally or artificially. Table 14 shows the numbers and type of scrapers found.

Table 14. Scrapers from the Donnaha Site.

	End	Side	End/Backed	Side/Backed	Double Edge
Steep	11	23	3	4	6
Sharp	15	29	4	7	3

The categories steep (Fig. 30k, m, n) and sharp (Fig. 301) correspond to edge angles of greater than or less than 45 degrees respectively. The different angle sizes may be related to different functions. Acute angled scrapers would most likely have been used as cutting tools (Wilmsen 1970). Studies of wear patterns on scrapers with steep working edges (Ranere 1973) indicate that this type of tool was generally used with the unworked surface down as an adze or plane. Such tools would have been useful in fleshing hides, in heavy shredding operations (Wilmsen 1970) and, when hafted, would have been very effective in shaving wood (Ranere 1973). The three scrapers that appear to have been hafted were all end scrapers. This may reflect a functional difference between the intended uses of end and side scrapers. However, there are no marked differences in edge angles between these two categories. The stratigraphic distribution of end, side, sharp, and steep scrapers is shown below (Table 15), with specimens from disturbed contexts omitted.

Table 15. Stratigraphic distribution of scrapers at Donnaha

Depth	End (%)	Side (%)	Sharp (%)	Steep (%)
surface	9 (38)	16 (29)	13 (41)	12 (26)
0-15	8 (33)	11 (20)	7 (22)	12 (26)
15-30	3 (12)	10 (18)	3 (9)	10 (21)
30-45	1 (4)	8 (14)	3 (9)	6 (13)
45-60	1 (4)	5 (9)	3 (9)	3 (6)
60-75	2 (8)	3 (5)	2 (6)	3 (6)
75-90		2 (4)	2 (3)	1 (2)
TOTALS	24 (99%)	55 (99%)	32 (99%)	47 (100%)

A total of 140 cores or core fragments was found (Fig. 31). Raw material percentages for the cores are shown in the Table 16.

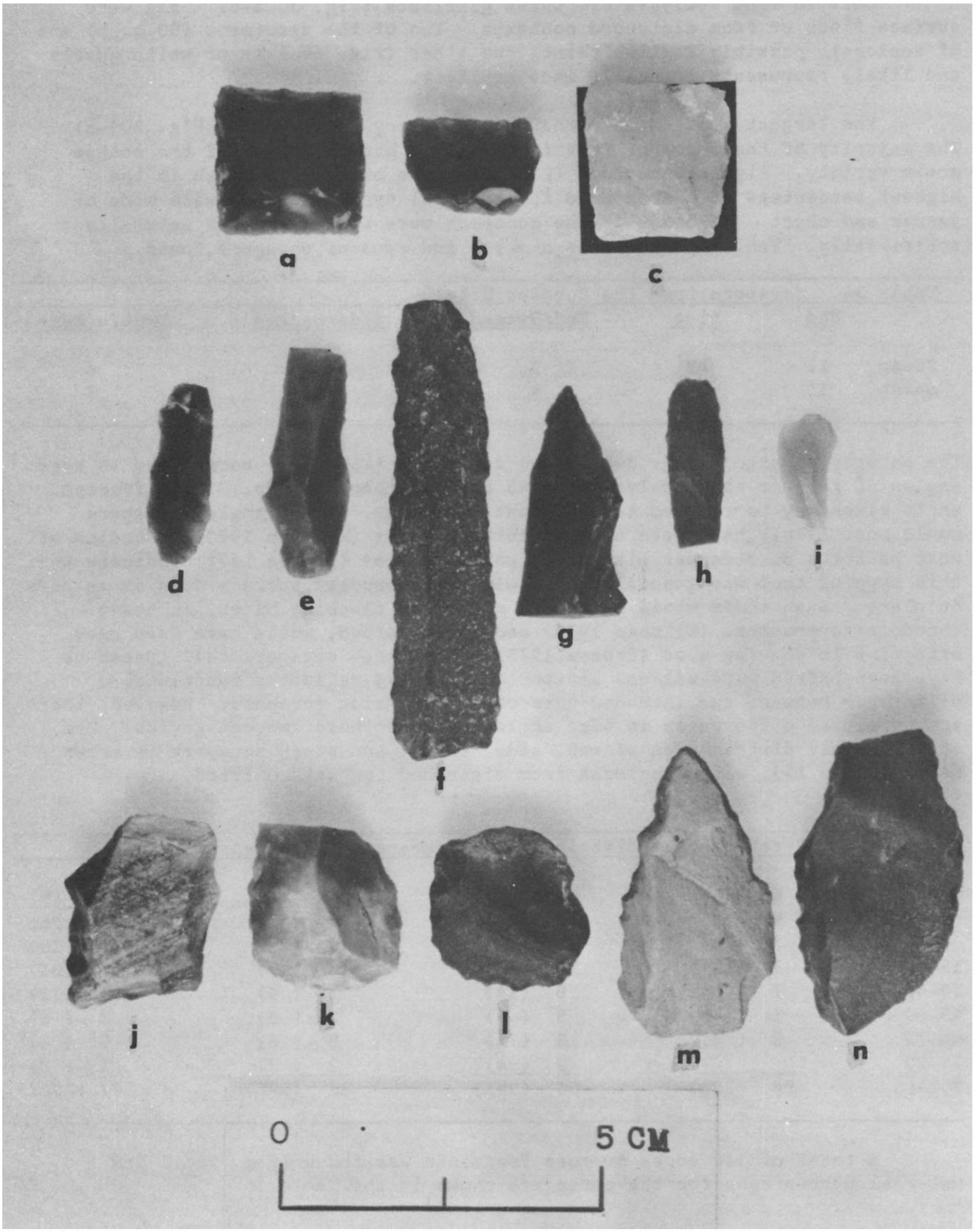


Figure 30. Stone tools and blades from the Donnaha Site: gunflints (a-c); blades (d-g,i); retouched blade (h); and scrapers (j-n).

Table 16. Raw material percentages for cores at the Donnaha Site.

	Fine grain felsite	Coarse Grain felsite	Jasper	Quartz
cores N=45	8%	71%	11%	8%
secondary cores N=86	22%	53%	6%	19%
exhausted cores N=9	44%	33%	0%	22%

Evidence of heat treating was found on 6 of the jasper (Fig. 31) and 3 of the felsite cores and secondary cores (Fig. 31). Secondary cores are large flakes from primary cores, from which other flakes are struck (Bradley 1973). A disproportionate number of primary and secondary cores are coarse grain felsite. Fine grain felsite cores were more extensively utilized as shown by over half of the exhausted felsite cores falling into this category (Fig. 31). If fine and coarse grain felsite was used indiscriminately in manufacturing projectile points and tools then the number of points and tools falling into these raw material groups should reflect the greater abundance of the coarse grain variety at the site. The results of the chi square tests show a definite preference for using the fine grain felsite in the manufacture of projectile points (Table 17) whereas raw material used in other tool manufacture (Table 18) more closely approximates the availability of raw material at the site.

Table 17. Chi square test of cores and projectile points vs raw material.

	Fine grain felsite		Coarse grain felsite		Totals
	O	E	O	E	
Cores (including secondary and exhausted cores)	27	(48.4)	81	(59.6)	108
Projectile points (using the three identified types)	117	(95.6)	96	(117.4)	213
TOTALS	144		177		321

$X^2 = 25.8$
critical value at d.f. = 1, a = .05 = 3.84

Table 18. Chi square tests of cores and tools vs raw material.

	Fine grain felsite		Coarse grain felsite		Totals
	O	E	O	E	
Cores (including secondary and exhausted cores)	27	(33.8)	81	(74.2)	108
Tools	66	(59.2)	123	(129.8)	189
TOTALS	93		204		297

$X^2 = 3.12$
critical value at d.f. = 1, a = .05 = 3.84

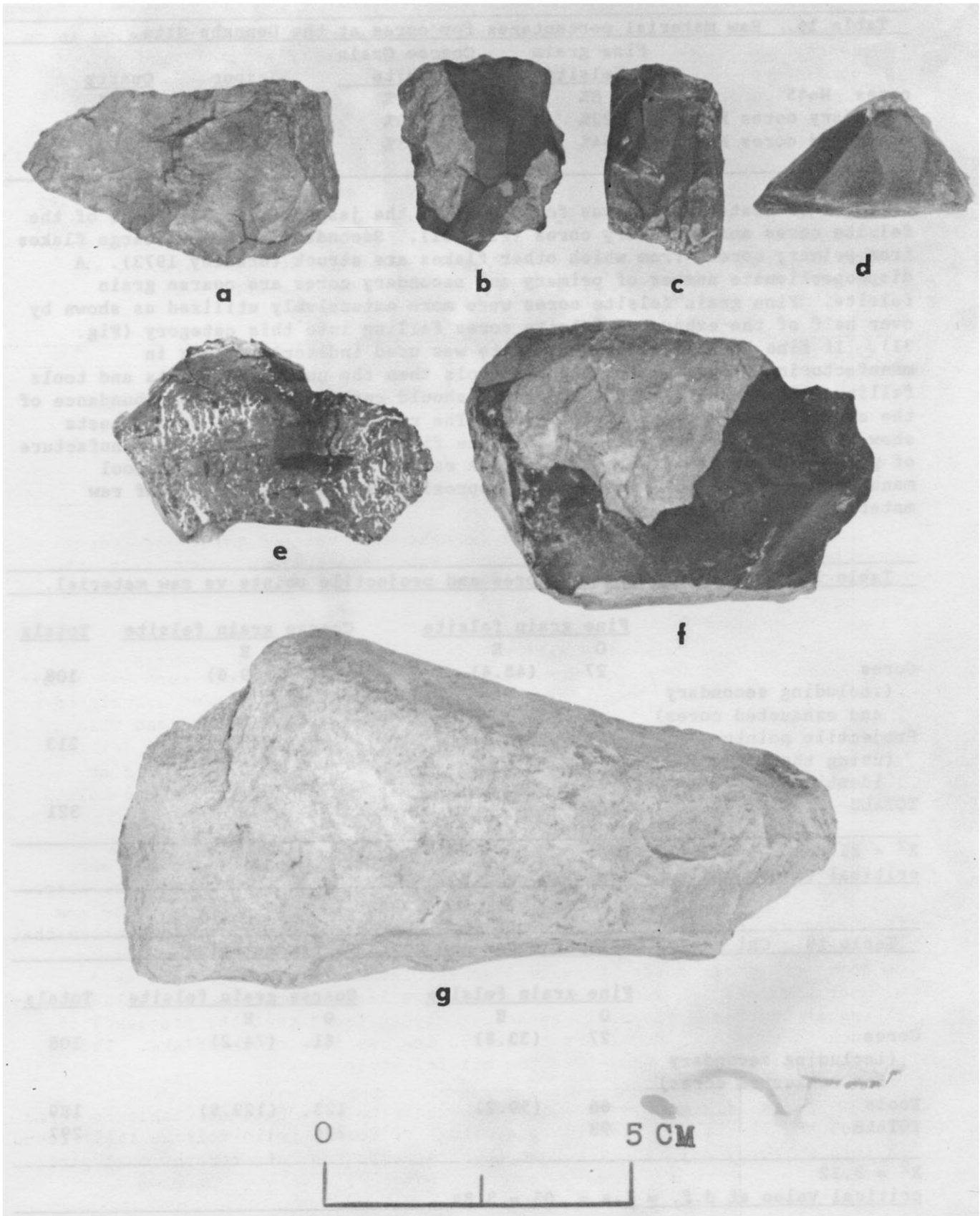


Figure 31.- Cores from the Donnaha Site.

The majority of cores recovered at Donnaha are small, averaging 46 mm in length and 35 mm in width. One polyhedral core (Fig. 31c), and two discoidal cores were recovered.

Only 31% of the primary cores and 24% of the secondary cores had greater than 50% cortex present (Table 19). This fact, combined with the high number of secondary cores, suggests that large unmodified cores were not being transported into the site. Initial reduction of the raw material was being conducted at either the quarry site or at an intermediate site. The low incidence of heat treating of the felsite cores, the discard of cores prior to exhaustion and without apparent use, and the method of flake removal all indicate that acquisition of felsite was not greatly restricted.

Table 19. Cortex on cores at Donnaha.

	Cortex > 50%	Cortex < 50%	No Cortex
Primary cores	14	15	16
Secondary cores	21	22	43
Exhausted cores	0	4	5

The remaining cores found at Donnaha were uni- or multi-directional examples from which flakes were struck rather haphazardly. Seemingly, the cores were then simply discarded once the desired number of flakes were removed.

Drills are the next most frequent tool type found at Donnaha (Fig. 32 a-f). The types of raw material used in their manufacture was almost evenly split between fine and coarse grain felsite. Attributes associated with drills are bifacial chipping, extremely narrow, parallel-sided blades, and steep-angled lateral edges (Ahler and McMillan 1976). Uses of drills include piercing, perforating, and boring. Four of the drills found at Donnaha appear to be points reworked after the hafted portion of the points had been broken.

Thirty retouched flakes and three retouched blades (Fig. 32h) were recovered. The majority of the retouched flakes (75%) were made using coarse grain felsite; only 1% of the blades is of the coarse grain type. The low frequency of retouch on flakes and blades supports the earlier contention that raw material was not difficult to obtain. Hayden (1978) found in his ethnoarcheological study of Australian aborigines that flakes were used without modification and then discarded when large numbers were available. In instances where raw material was scarce Hayden found that the frequency of retouch increased in an effort to extend the use life of the flake. The probable use of these tools was for cutting implements.

The 27 biface fragments found at the site were unidentifiable in terms of tool and function. The high percentage of coarse grain felsite (54%) found in this category may indicate that the fragments are not, for the most part,

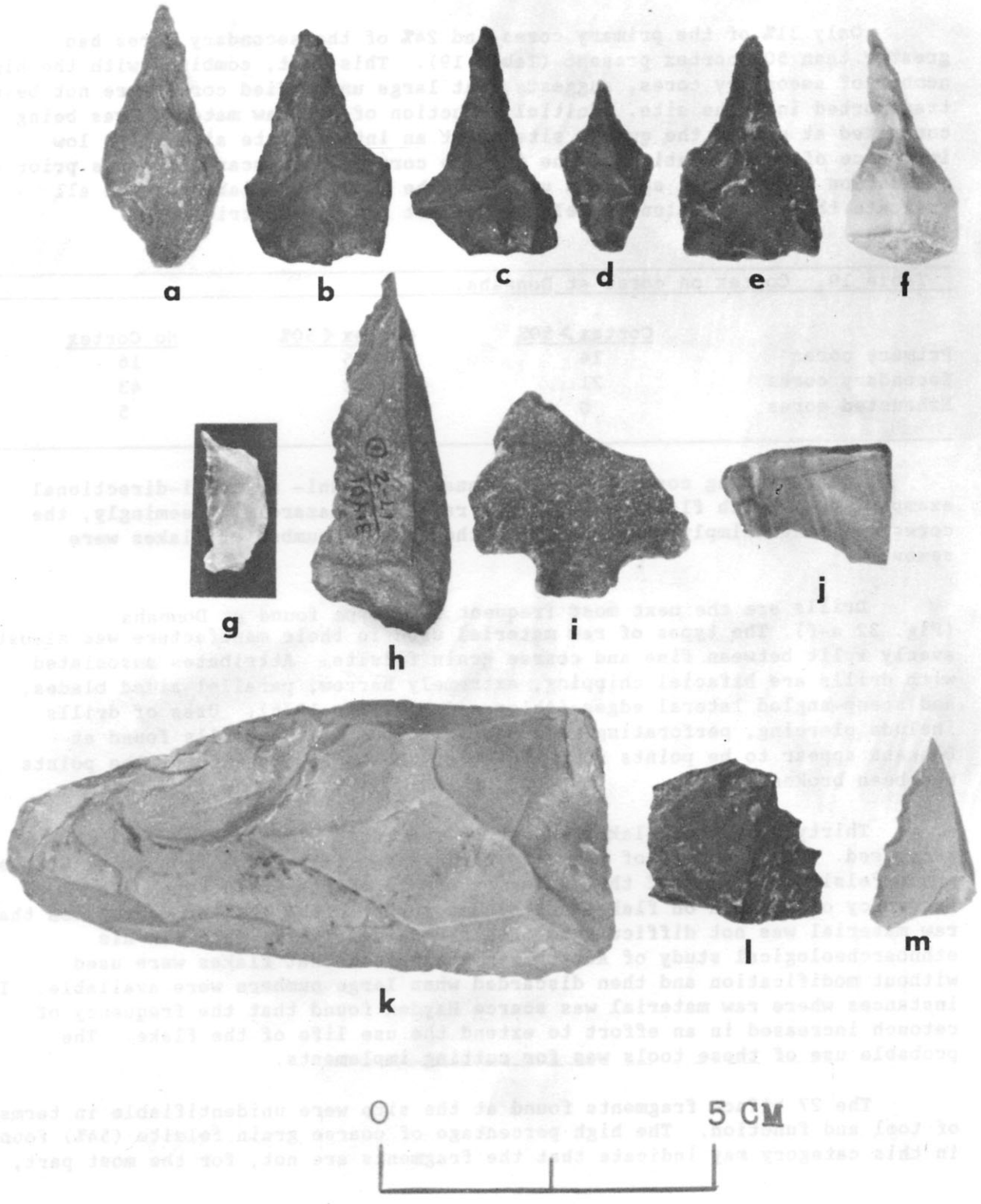


Figure 32. Stone tools from the Donnaha Site: drills (a-f); gravers (g,h); notches (i,j); biface (k); and denticulates (l,m).

projectile points. The bifaces may have functioned in some other capacity such as knives.

Thirteen gravers were recovered (Fig. 32g, h). On the basis of experimental studies Ranere (1973) concludes that gravers were used in the same fashion as steep scrapers, pushed along the surface being engraved so that the underside of the bit becomes heavily polished. Polish was present on the specimens found at Donnaha. Uses for gravers include fine engraving of bone, shell, and wood.

Five possible knives and knife fragments were recovered. One of these (Fig. 32g) is naturally backed and measures 110 mm in length and is 54 mm wide. All of the specimens were bifacially worked and have a smoothed appearance along one or both lateral edges. Eighty percent were made of coarse grain felsite.

Within the miscellaneous category are several combination tool types. One (Fig. 32k) is a biface made on a thick flake. This tool is polished on the distal end and the flake scars have been smoothed. Its use is unclear, but the polish may be indicative of use in sandy soil where the resulting abrasion would account for the smoothing. Combination tools are not uncommon in the archeological record (Dragoo 1973) and are one method of maximizing the utility of a raw material.

Two other tool types in the miscellaneous category are notches (Fig. 32i,j) and denticulates (Fig. 321,m). Notches, also referred to as spokeshaves or concave scrapers are made from thick flakes. These tools have two or three small flakes removed on the ventral face of the flake in such a way as to form a slight concavity. As the tool is used, small irregular flakes are removed along the dorsal surface. This is attributed to pulling the tool along a wooden or bone shaft in the process of straightening (Ranere 1973, Dragoo 1973). Denticulates are a type of cutting tool that exhibit a series of tooth-like projections. Bordaz (1970) speculates that denticulates were probably used in processing plant material and perhaps for such fundamental tasks as whittling wood for spear shafts.

The stratigraphic distribution of the various tool types is shown in Table 20. The table shows a greater diversification of tool types and a greater abundance of raw material at the depth 15 to 30 cm below plow zone. This is the same stratigraphic level at which the Uwharrie point type peaks. With the exception of cores, all the major tool categories show an increase in number as the upper levels of the site are approached. The decline in the core category at a depth of 0-15 cm below plow zone corresponds to the level at which the miscellaneous point category composed of marginally retouched points reaches its climax. The use of marginal retouch and recycling of points as demonstrated by the presence of patinated flake scars may indicate scavenging in response to a decrease in raw material availability.

Debitage. The category debitage is composed of flakes and debris from the process of stone tool manufacture. The importance of debitage in lithic

Table 20. Stratigraphic Distribution of Tool Types at Donnaha (Artifacts from disturbed context omitted).

Depth	Biface Fragment	Gravers	Primary, Secondary Cores	Drills	Knives	Retouched Blades	Retouched Flakes	Scrapers	Denticulates	Notches
Surface	10 (37%)	7 (54%)	29 (23%)	5 (21%)	2 (40%)	1 (33%)	12 (40%)	26 (30%)		
0-15	9 (33%)	2 (15%)	25 (20%)	12 (50%)		1 (33%)	11 (37%)	21 (24%)	1 (50%)	
15-30	4 (15%)	2 (15%)	38 (30%)	5 (21%)	1 (20%)	1 (33%)	5 (17%)	15 (17%)	1 (50%)	1 (50%)
30-45	4 (15%)	1 (8%)	30 (23%)	2 (18%)	1 (20%)		2 (6%)	11 (13%)		
45-60		1 (8%)	2 (2%)		1 (20%)			6 (7%)		1 (50%)
60-75			1 (1%)					5 (6%)		
75-90			1 (1%)					2 (2%)		
TOTALS	27 (100%)	13 (100%)	126 (100%)	24 (100%)	5 (100%)	3 (99%)	30 (100%)	86 (99%)	2 (100%)	2 (100%)

analysis stems from the facts that, first, debitage is often the most highly represented artifact type at a site and, second, debitage remains at the locus of manufacture and is generally not subject to relocation and modification (Collins 1975). Although a complete debitage count is not available, over 10,000 flakes and debris specimens from Donnaha have been analyzed. The model used in this analysis is one developed by Sullivan (1980).

The analysis was restricted to flakes and debris of felsite, jasper, chert, and chalcedony. Quartz debitage was not included because its unpredictable flaking properties and the inability to recognize certain relevant features on quartz flakes would have hindered the analysis. This omission should not greatly affect the results as quartz accounts for only 7% of the total debitage in the sampled excavation units. Two statistical tests were used to determine if quartz maintained a lower proportion to felsite between different areas of the site. A small sample T test was used to determine if the ratio of felsite to quartz was significantly greater in 14 randomly selected excavation units. Felsite was found to consistently occur in greater proportions across the site. A Mann-Whitney U test was used to compare the ratio of quartz to felsite in the main area of occupation in contrast to the outlying excavation units. The results of this analysis ($U = 78$, $z = .37$, $p = .144$) demonstrates that the ratio of felsite to quartz between the two samples is about the same.

Using the method outlined by Sullivan (1980:107) the debitage was placed in particular categories, referred to as product groups (PG), on the basis of the presence or absence of certain attributes. These categories include:

PG 1: complete non-cortical flakes
PG 2: complete cortical flakes
PG 3: broken non-cortical flakes (bulb of percussion present)
PG 4: broken cortical flakes (bulb of percussion present)
PG 5: non-cortical flake fragments (bulb of percussion absent)
PG 6: cortical flake fragments (bulb of percussion absent)
PG 7: non-cortical debris (interior surface not detectable)
PG 8: cortical debris (interior surface not detectable)

The results of the application of this model to the Donnaha debitage follow:

Table 21. Results of debitage product group analysis at the Donnaha Site.

Totals for debitage in the plow zone of excavation units 1-6, 10-15, 18, 19:

	PG 1	PG 2	PG 3	PG 4	PG 5	PG 6	PG 7	PG 8	TOTALS
N	452	187	672	153	766	267	131	100	2728
(%)	(16.6)	(6.9)	(24.6)	(5.6)	(28.1)	(9.8)	(4.8)	(3.7)	(100%)

Totals for debitage in the plow zone of excavation units 16,17,22,24,34-39:

	PG 1	PG 2	PG 3	PG 4	PG 5	PG 6	PG 7	PG 8	TOTALS
N	994	483	1748	423	1408	561	235	248	6100
(%)	(16.3)	(7.9)	(28.7)	(6.8)	(23.1)	(9.2)	(3.9)	(4.1)	(100%)

Table 21. Continued

Totals for debitage in 0-15 cm level, excavation unit 34:

	PG 1	PG 2	PG 3	PG 4	PG 5	PG 6	PG 7	PG 8	TOTALS
N	92	40	151	39	173	53	8	9	565
%	16.3	7.1	26.7	6.9	30.6	9.4	1.4	1	99.4%

Totals for debitage in early trash pit, excavation unit 39:

	PG 1	PG 2	PG 3	PG 4	PG 5	PG 6	PG 7	PG 8	TOTALS
N	10	3	14	5	14	3	0	1	50
%	20	6	28	10	28	6	0	2	100%

Totals for debitage in trash pit 40-3:

	PG 1	PG 2	PG 3	PG 4	PG 5	PG 6	PG 7	PG 8	TOTALS
N	54	19	70	27	89	37	6	7	309
%	17.5	6.1	22.6	8.7	28.8	11.9	1.9	2.3	99.8%

On the basis of the similar frequencies within Product Groups horizontally and vertically a few general statements can be made concerning the nature of the debitage at Donnaha. First, the Product Groups for cortical and non-cortical debris are consistently the most under-represented groups. Large quantities of debris are generally associated with primary reduction loci. Locations of biface manufacture, in contrast, are characterized by low frequencies of debris (Sullivan 1980). Second, non-cortical Product Groups exceed their counterparts in the cortical debitage groups by greater than 50%. The low frequency of cortical flakes indicates that alteration of cores was being conducted at locations other than the sampled areas of the Donnaha Site.. The average weights for complete non-cortical and cortical flakes are .43 grams and .99 grams respectively. The small flake size supports the evidence that there is little or no evidence of preparation of large nodules of raw material at Donnaha. A final observation is that the Product Groups with the highest frequencies are PG 3, broken non-cortical flakes, and PG 5, non-cortical flake fragments. A high ratio of broken to complete flakes has been attributed to such factors as tool manufacture and flake utilization (Sullivan 1980). Either or both factors could be responsible for the high occurrance of broken flakes at Donnaha because, first, the manufacturing of implements appears to have proceeded from a secondary stage and was probably of a finishing nature; and second, there was little retouch on flakes suggesting that if flakes were used as tools they were used in an unmodified form and then discarded. Raw material represented in the Donnaha debitage is shown in Table 22.

Table 22. Raw material for debitage, the Donnaha Site.

	Fine Grain Felsite	Coarse Grain Felsite	Exotic
flakes and debris	30%	68%	2%
blades	39%	58%	3%

The preponderance of coarse grain felsite flakes reflects the greater abundance of coarse grain material at the site in the primary and secondary cores (Table 16). Also examined with regard to raw material were blades.

Blades were recognized as any complete flake twice as long as it is wide (Fig. 30d-i). The frequency of blades in the debitage sample ranged from 3% to 5% with an overall frequency of 4.7%. Blades in similarly low frequencies have been recorded for other Woodland sites in the Yadkin Valley (Woodall and Newkirk 1976). A chi square test was used to test the null hypoesis that the frequency of blades is independent of raw material.

Table 23. Chi square test for flakes and blades vs raw material.

	Exotic	Fine Grain Felsite	Coarse Grain Felsite	Totals
flakes	210 (212.4)	2647 (2695.1)	6443 (6392.4)	9300
blades	13 (10.5)	182 (133.9)	267 (317.6)	462
Totals	223	2829	6710	9762

$X^2 = 28.61$

critical value of d.f = 2, a = .05 = 5.99

The result of the chi square test is that blades do not occur independently of raw material. The contributing factors are a higher number of blades than would be expected in the raw material class fine grain felsite and a lower than expected count in the coarse grain felsite group, suggesting a tendency for more economical use of the finer quality material.

Conclusions

For the majority of its occupation Donnaha was a multiple activity site. Activities associated with hunting, plant processing, bone and wood working, and tool manufacture are all indicated in the lithic assemblage. Intensive occupation of Donnaha probably began during the Uwharrie phase. Prior to this time occupation may have only been seasonal, with the site being used as a hunting and collecting camp. Evidence for this is the higher proportion of scrapers, both steep and acute angled, to other tools found in the levels 45 to 75 cm below plow zone. As the Uwharrie point type is approaching its maximum frequency (30-45 cm below plow zone), a nearly full complement of other tool types is also present. Hunting and hide working are indicated by the presence of end scrapers and cutting tools such as acute angled scrapers and retouched flakes (Wilmsen 1970). The proportion of steep angled scrapers doubled from the previous level and exceeds the number of acute scrapers. This may indicate a trend toward an increasing importance of processing plant fibers. The presence of steep scrapers along with drills and a graver suggests that bone and wood working were also being conducted. At the peak of the Uwharrie point type use the full array of tools is present. Burins, drills, retouched flakes, and steep-edged and side scrapers all increase. There is perhaps at this time a greater focus on plant processing and bone and wood working. With the exception of drills and cores the remaining major tool types show a continued gradual increase in number throughout the remaining levels of the site.

Tool manufacture was an important activity conducted at Donnaha. Non-local felsite was the preferred raw material and was acquired in the form of secondary cores and blanks. Although felsite is not available locally evidently little was done toward conserving it. Some curation effort is suggested by blade production and retouched flakes and blades, but these instances of implied conservation are negligible. If the felsite was not being procured directly, perhaps the social organization of the group or groups occupying the site was such that there was a great capacity for trade and ability to acquire as much felsite from the supply zone as necessary. The slight decline in primary and secondary cores evident at the 0-15 cm below plow zone level and corresponding increase in retouched flakes and marginally retouched projectile points may indicate a disruption of the trading network.

CONCLUSIONS

Perhaps a preliminary report should forego a Conclusions section, inasmuch as certain critical data classes remain to be examined in detail. A summing of our current information seems useful at this time, however, because it can be used to generate a model of those processes which may have impinged on the Donnaha occupants to create the data currently at hand. This model in turn will direct our efforts in future work, efforts which may result in the creation of modified or completely new models.

The Donnaha Site represents a village, occupied throughout the yearly cycle, on the riverine edge of an unusually large Yadkin River floodplain. The main occupation was between A.D. 1000 and A.D. 1500, probably with an earlier and weakly apparent (seasonal?) occupation at about 0 A.D. The economy was dependent on certain wild food products, particularly deer, raccoon, turkey, fish, shellfish, and nuts supplemented by maize horticulture. Raw materials for most stone tools was acquired via trade from the source 50 km distant, while various shell artifacts were originating on the coast some 350 km away.

There is no evidence for social ranking or stratification at Donnaha. Status--as inferred from the burials and attendant body ornaments--was based on sex and age, consonant with a simple kin-based social organization. Population probably was low at most times at the site, although this is notoriously difficult to gauge. A reasonable estimate--admittedly little more than a guess--would be ca. 50 persons as an average. Certainly the population was not measured in the thousands. Donnaha is one of many sites, similar in regard to location and approximate age, scattered along the banks of the Yadkin's Great Bend area. These sites have been assessed by Barnette (1978), who found site size is correlated with the size of the bottomland tract in which they are located. Interriverine uplands were largely abandoned.

Donnaha and her sister sites represent a conservative cultural system when contrasted with those contemporary sites, elsewhere in the Southeast, that exhibit effects of a Mississipian lifestyle. No mounds were built, no exotic geegaws imported to set off a class of high rank. In many regards the pottery resembles wares produced 2000 years earlier in the Northeast, 1000 years earlier in North Carolina; the bone and shell assemblage would be almost indistinguishable from that of late Archaic sites in Tennessee or Kentucky (and probably North Carolina if preservation of these tools had occurred); and the focus of the economy remained on wild foods, as it had for the past 10,000 years. Any processual model must account for this conservatism--what is not present may be as significant as what is present.

Now, consider the Figure 33 diagram which represents a simplified portion of a model intended to address this apparent conservatism.

A. Maize horticulture. The beginnings of horticulture in the Great Bend area probably are to be found in a late Archaic context, although timing is not

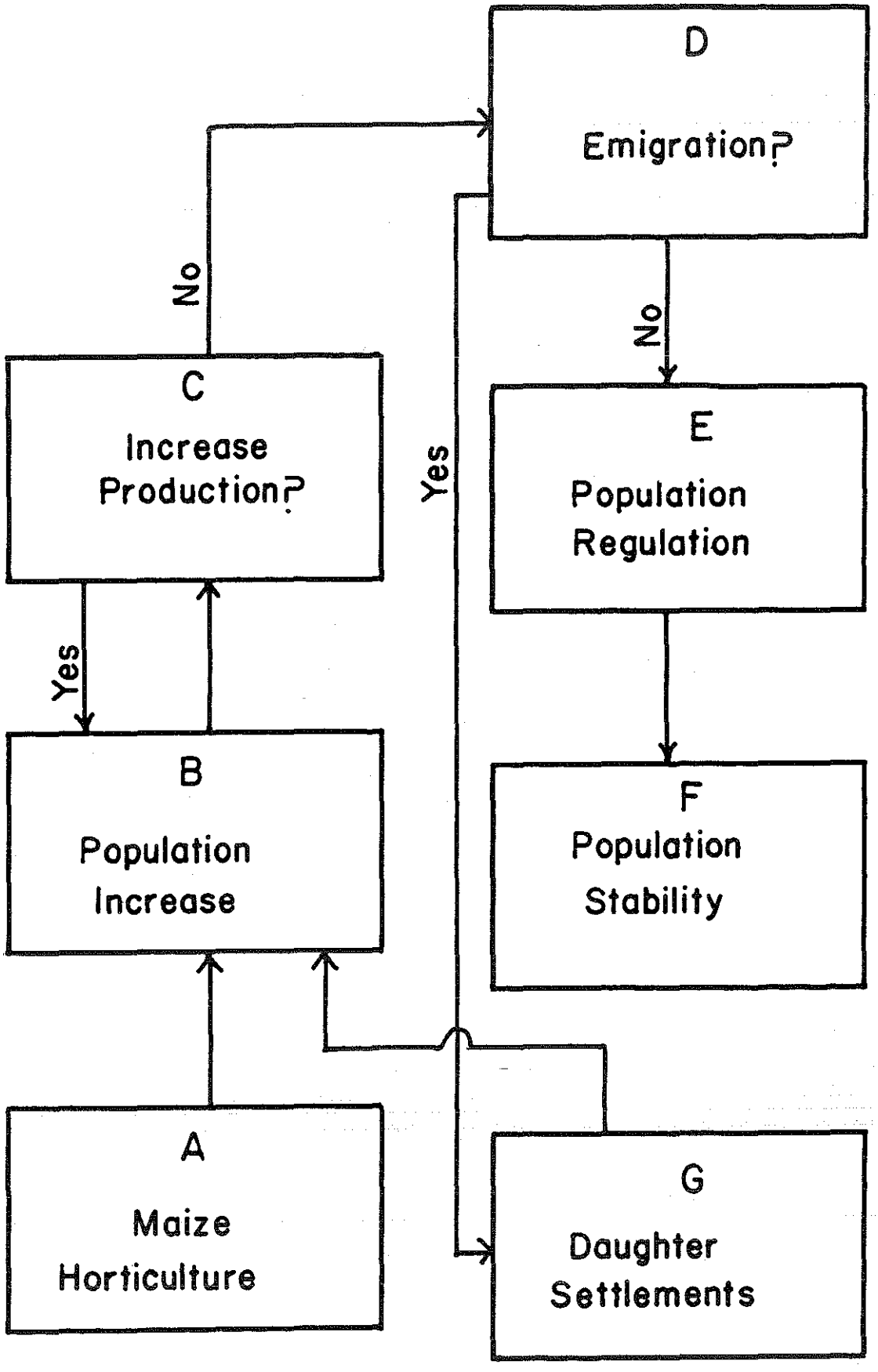


Figure 33. A model of culture change and stability at the Donnaha Site and in the Great Bend area.

critical for present purposes. It is important that at that time the existing population was utilizing an array of resources, one or several of which was a less efficient energy source than maize. Thus it is assumed that the resident late Archaic population would be classified as practicing a "diffuse" economy in Cleland's model (1976), including various riverine resources in the diet. Inclusion of these resources, reflecting as they do a lower energy net gain than mammals of equivalent weight (Parmalee & Klippel 1974), suggests that population was in homeostasis and significant increase would be possible only with an altered technology. Given the attraction of riverine resources in the spring and summer--when upland hardwoods are least productive--small scale maize cultivation in the bottomland would present no scheduling conflict and was likely to be added to a varied diet, perhaps one already including native cultigens and/or squash.

B. Population Increase. It is necessary to postulate that maize cultivation would result in a population increase in the Great Bend area. This could occur in two ways: an increase in the number of births per female, i.e. an absolute increase for the region; or an increased population density for riverine locales as a result of migration from upland settings, a response to the now-enhanced energy potential of river-bank settlement.

C. Increase Production? With this step the process may enter upon a deviation amplifying loop, and the consequences are crucial. As the number of inhabitants at a single site increases, collection of natural foods will be intensified by exploiting larger areas, utilizing previously ignored resources, or both (Cohen 1975). Because the yield of wild foods cannot be controlled, however, it is likely that domesticates will assume greater importance as more available soil is put into production. In the Great Bend area this would mean the natural levees would be increasingly cultivated.

D,G. Emigration and Daughter Sites. These levees are linear, however, and as the cultivated area increases there would be increased costs incurred by occupants of a single site moving to and from garden plots, in accordance with Ricardo's Principle of Least Rent (Ricardo 1821: 91-106). These costs would be mitigated with establishment of daughter sites scattered at intervals along the river banks (Chisholm 1968:66. Rindos 1980:762).

E. Population Regulation. As wild foods become increasingly costly, and adjacent land suitable for horticulture is utilized, population regulating mechanisms will appear. These may be abortion, infanticide, enlarged incest taboos or other devices, but in any instance population is brought into homeostasis once more.

F. Population Stability. The Great Bend population would remain in a dynamic equilibrium state until its ecology is disturbed, which it was by the European invasion after A.D. 1600.

Components B, C, and D are of particular importance in this model of processes affecting the Great Bend late prehistoric populations and the observed archeological patterns. Increasing production (C) is understood as

simply expanding the use of the natural levee. Additional land was available adjacent to the levee, namely the backswamp soils and the uplands. Before these could be cultivated, it would have been necessary to make substantial capital investment however, entailing clearing, draining and/or terracing. Such undertakings would require a measure of social complexity beyond the egalitarian system indicated at Donnaha. Thus the potential for increasing food production was vested in the social organization as well as in the extent of arable land, but the level of social complexity is determined by the population density prior to initiation of the intensive cultivation methods. Just what that population density must be--the "critical mass" that moves a social order from egalitarian to ranked or stratified--has been the subject of some debate (Narroll 1956; Phillips 1973:529; Wright 1978:218; Stevenson 1965; Hassan 1981:233; Orans 1966), but all estimates involving horticultural societies are well below any reasonable estimate of the Donnaha population.

As mentioned earlier, Donnaha is but one of numerous Woodland sites present in the floodplain below the Great Bend, and for the study area, i.e. the 26.5 km covered by the surveys of 1974 and 1975, the population must have been well above 1000. It is considered crucial that the floodplains are not contiguous, however. As mentioned in the Natural Setting section, the meanderings of the Yadkin have broken up the bordering floodplain into large isolated tracts, "islands" of alluvial soil, which must have served to minimize what Narroll calls the "urbanization variable," i.e. the number of people within effective range of easy interaction (1956:693). Thus the technology available, when coupled with the environmental features described above, discouraged that level of population concentration which prompts a social re-organization, which in turn could have expanded the productive capacity of the cultural system, but also would have initiated a disasterous feedback loop.

This "disasterous feedback" involves the relationship between the cultural system and its natural environment, particularly those subsystems affecting low-cost, high yield energy sources--deer, turkey and raccoon. Calculating an optimum adult dietary need for 240 g of animal protein per day, it is clear that a substantial hunting reservoir is necessary even for a settlement of 50 persons. These animals were especially important to the Great Bend populace because the floodplains do not receive appreciable amounts of what Smith calls "an externally subsidized energy source," i.e. fish and waterfowl taken from seasonally flooded oxbow lakes (Smith 1978:485). Such lakes did not exist, nor is the area on a principle flyway. Elsewhere in the Southeast, as populations increased their hunting territories either expanded or previously ignored species were incorporated into the diet, usually both. These steps incur increased energy costs per unit of edible meat, and energy shortfalls could only be filled by increasing the consumption of domesticates. This increasing reliance on domesticates encouraged higher population density (around large tracts of arable land) but would exacerbate the problem of obtaining necessary animal protein within the catchment area. The result in at least some instances was chronic poor health, typified by iron deficiency and other, non-specific, dietary stress (El-Najjar 1976) caused by inadequate protein intake (Robbins 1977).

To summarize our current model: a settlement pattern shift to riverine sites accelerated during late Archaic/early Woodland times as a consequence of grafting maize-squash horticulture to a subsistence pattern already utilizing riverine resources. As populations--previously dispersed--concentrated in the floodplains of major streams, increased energy costs for animal protein were mitigated by increasing the use of domestic plants until a reliance on such domesticates "anchored" these Woodland groups to the bottomland sites. By Middle Woodland times, say A.D. 1000, populations had stabilized below that level necessary for a ramified organizational structure, a result of the limited and patchy occurrence of easily tilled natural levees. Perhaps more importantly, the narrow, patchy levees stabilized the human population at a predation level tolerable for deer, turkey, raccoon (and probably beaver) populations. This predator-prey relationship remained stable as long as the human population growth was kept in equilibrium by the available arable land, i.e. the natural levee soils. Presumably, by A.D. 1000 domesticates (and cultigens) had assumed an essential role in a varied aboriginal diet, and in accordance with Liebig's Law of the Minimum (Liebig 1840), the human population was maintained at a level commensurate with the acreage of the levees producing those domesticates.

Test Implications

If the above account is to be evaluated in terms of its approximation to reality--reality of what happened in the past--then it is necessary to derive its test implications. These, when formulated as hypotheses, provide direction for future fieldwork and laboratory analysis.

(a) Population size within the Great Bend area will show little change between A.D. 1000 and A.D. 1500.

(b) Animal species procured during the Woodland stage show no change in regard to species ratios or age distribution of single species.

(c) Woodland sites in the inter-fluvial zones are limited activity loci--year-round occupation sites do not occur.

(d) Mortality curves for Middle and Late Woodland populations will be similar, with no evidence of increased nutritional stress, but with evidence of occasional seasonal protein shortages.

(e) There will be no evidence for utilization of backswamp or upland soils for horticulture.

(f) Post-marital residence rules, as reflected in intra- and inter-site human skeletal analysis, will show preferred or prescribed virilocality.

(g) The population of riverine sites occupying a contiguous tract of alluvium will vary proportionately with the area of the adjacent levee sands or sandy loam soils.

This list is not exhaustive, and not all these test implications can be readily translated into hypotheses for archeological testing. For example, (a) and (g) require the definition of an archeological variable set which demonstrably monitors population size, and the old problem of precise contemporaneity between sites is again a difficulty. Item (d) requires a large sample of late Archaic burials, currently not available, and (e) can be tested currently only by securing and analyzing hundreds--perhaps thousands--of pollen and phytolith samples. Nevertheless the model does focus attention on the deterministic man-land relationships which existed in the past to produce the archeological record of today.

APPENDIX I
HUMAN SKELETAL ANALYSIS
by David S. Weaver

The Donnaha skeletal sample is of typical American Indian morphology. A number of the characteristics which are consistently found in American Indians are in high frequency in the sample. Shovel-shaped incisors are ubiquitous, with a few cases of double shovelling. This incisor shape is typical of Mongoloid populations, and of American Indians in particular (Hrdlicka 1920). Wormian bones, the accessory bones found in the lambdoidal suture of the skull, are also common in the sample, including a very pronounced form known as the Inca bone. Both wormian bones and the Inca bone are in higher frequency in American Indians than in any other racial group (Bennett 1965). The overall morphological pattern indicates that the people of Donnaha were short, not heavily muscled, and generally free of skeletal anomalies.

The pattern of pathologies of the sample implies a population under considerable nutritional and disease stress. While fractures seem to have been rare, with only one definite case in evidence, and evidence of traumatic death is nonexistent, dental disease was widespread and the evidence for persistent anemias is persuasive.

The dentition of the adult specimens from the site indicates a tough, gritty diet which may well have been high in carbohydrates. The severity of dental wear at first gives the impression that an individual must have been much older at death than a subsequent examination of other ageing criteria implies. This high degree of dental wear is common in populations which concentrate on an agricultural diet (Brothwell 1981:71-2). Of course, a diet which emphasized the gathering of wild plant foods which were then processed by grinding would also have a high proportion of grit. The universality of severe dental caries and common abscesses with attendant dental loss in the Donnaha sample provides a strong implication of a relatively high carbohydrate diet (Wing and Brown 1979:89-90). There is no evidence of interproximal grooving, which has occasionally been cited as evidence for the practice of dental prophylaxsis (Bass 1971:241). Dental tartar (calculus) is found on the lingual side of some of the adult's molars, and is a further indication of the lack of conscientious dental care and of a high carbohydrate diet (Wing and Brown 1979:90). Calculus has also been used as an indicator of the presence of carbonates in the saliva, usually as a result of the addition of mineral salts in the diet. These salts, except in the case of intentional addition in some aboriginal forms of drug use (Klepinger, Kuhn, and Thomas 1977), are commonly introduced in the grit which results from the grinding of foods on soft stone surfaces.

The dental abscesses, which seem to have progressed in the normal sequence in most of the individuals from the site,--caries, infection, the formation of a pocket of pus at the root, tooth evulsion, and healing, in the form of resorption of the socket--led to two easily diagnosed cases of chronic osteomyelitis. Osteomyelitis is the general term for nonspecific infection of

the bone, and usually results from the introduction of Staphylococcus aureus into the bloodstream. The organism settles in the metaphyseal regions of the long bones, where circulation is relatively poor and it is less likely the immune system will be successful in eliminating the pathogen. Osteomyelitis is progressive and debilitating, resulting in the eventual death of the individual (Steinback 1976:Chap. 3). However, since it is a disease which results from the noncontagious infection of one individual at a time, it does not allow inferences concerning housing patterns or habitual activity patterns.

Porotic hyperostosis, a condition of the cranial bone which is usually considered to be the result of either hemolytic or dietary anemias, is in high frequency in the Donnaha sample (Phillips and Weaver 1979). As hereditary hemolytic anemias are unknown for American Indians, most authors have argued that porotic hyperostosis in American Indian populations is the result of diets which encourage anemias (El-Najjar 1976). Specifically, diets which are either low in iron or which do not contain sufficient animal fats to transport available dietary iron across the intestinal wall are most often cited as the causes of cranial signs of anemia (El-Najjar 1976). Diets based on maize, to the exclusion of animal fat and protein, are known to produce high frequencies of porotic hyperostosis (Parham and Scott 1980). Alternatively, a dependence on fresh-water shellfish, as may well have been the case at least during particular seasons at Donnaha, would lead to a marked deficiency of dietary fat and a probably excess of dietary calcium (Parmalee and Klippel 1974), both of which would inhibit the assimilation of whatever dietary iron which might have been available. In any event, the high frequency of porotic hyperostosis clearly indicates severe and chronic insufficiencies in the diet of the occupants of Donnaha.

An analysis of the ratio of Carbon 13 to Carbon 12 in a small sample of individuals from the site adds to the interpretation of the likely diet. Using the ratio, it is possible to estimate the proportion of dietary carbon which originated in plants which have a C4 metabolic pathway (Vogel and van der Merwe 1977). The most common C4 plant in North America is maize. The ratios for a sample of six individuals from Donnaha range from -13.1 to -17.8, implying dietary proportions of C4 plant contribution to the diet ranging from 26% to 59% (van der Merwe, Vogel, and Weaver, n.d.). It is worth noting that the highest percent contributions, 59 and 43%, come from Burials 34-56 and 34-144, respectively. Burial 34-56 is one of the two cases of chronic osteomyelitis and is an individual who would have had severe dental pain and might well have been restricted to a diet which could be easily ingested with a minimum of chewing, for example, a diet of maize gruel or porridge. Burial 34-144 is the remains of a 2 year old child with an active case of porotic hyperostosis, thus adding credence to the link between diet and cranial pathology. The lowest percentage of C4 contribution, 26%, is from Burial 34-143, a young adult male with no evidence of pathology or anomaly. The mean percent C4 contribution for the sample, 37.8%, implies a major contribution of C4 plants to the diet at Donnaha. While marine mollusks have been shown to produce dietary C13/C12 ratios similar to those of C4 plants, fresh-water mollusks show values which are similar to C3 plants (Norr 1981). Therefore, the likelihood that the ratios observed for Donnaha are perturbed by a

contribution of mollusks to the diet is unlikely. Obviously, the combination of a diet of maize and fresh-water mollusks would be even more deleterious than a diet dependent on either food source. The widespread pathology seen in the Donnaha sample may well be the result of a synergism between several marginally unsatisfactory dietary choices, which have compounded to produce a most unsatisfactory situation.

In summary, then, the Donnaha skeletal sample presents the picture of a population of typical American Indian morphology, with no evidence of unusual trauma, a mild incidence of disease pathology, and a high incidence of dietary-induced pathology. The dietary problems may well have been seasonal, exacerbated by specific food choices, but the problems were certainly of consequence to the population.

BURIAL DESCRIPTIONS

F.S. 13-4

The assorted human bones from this excavation unit comprise portions of two adult hands, a foot, a fragment of a lumbar vertebra, and the xiphoid process of an adult sternum. There is no evidence of anomaly or pathology.

F.S. 16-6

This burial is the remains of a 20-25 year old female. Even at this young age, caries are evident on the molars and there is marked crowding of the anterior dentition. The postcranial skeleton is fragmentary. No pathology or anomaly was observed, except for the dental caries.

F.S. 16-8, 16-9, 24-7

Burial 16-8 is that of an adult, greater than 40 years of age at death, of undetermined sex. The remains are highly fragmentary, the largest of the bone fragments being several long bone shaft segments. The surviving dentition is heavily worn, with almost complete exposure of the dentin. The teeth present wear patterns that imply considerable antemortem movement of the teeth in the jaws, which in turn indicates that several of their adjoining teeth had been lost antemortem, probably to dental or periodontal disease, and the remaining teeth had drifted in the alveolus to positions of atypical occlusion. Such a realignment of the dentition would not be unusual for an older individual of the Donnaha sample, where dental disease and subsequent loss of the teeth is quite common.

F.S. 16-9 is an adult female, of greater than 30 years of age at death, and presents the typical pattern of dental pathology for this sample. Dental wear is pronounced and there are numerous caries in the molar fields This specimen presents the only conclusive case of a longbone fracture in the sample. The right radius has been fractured and healed and a possible fracture of the right ulna is implied. The healing proceeded normally without complication although there remains a slight torsion misalignment of the shaft of the radius (Fig. 35b).

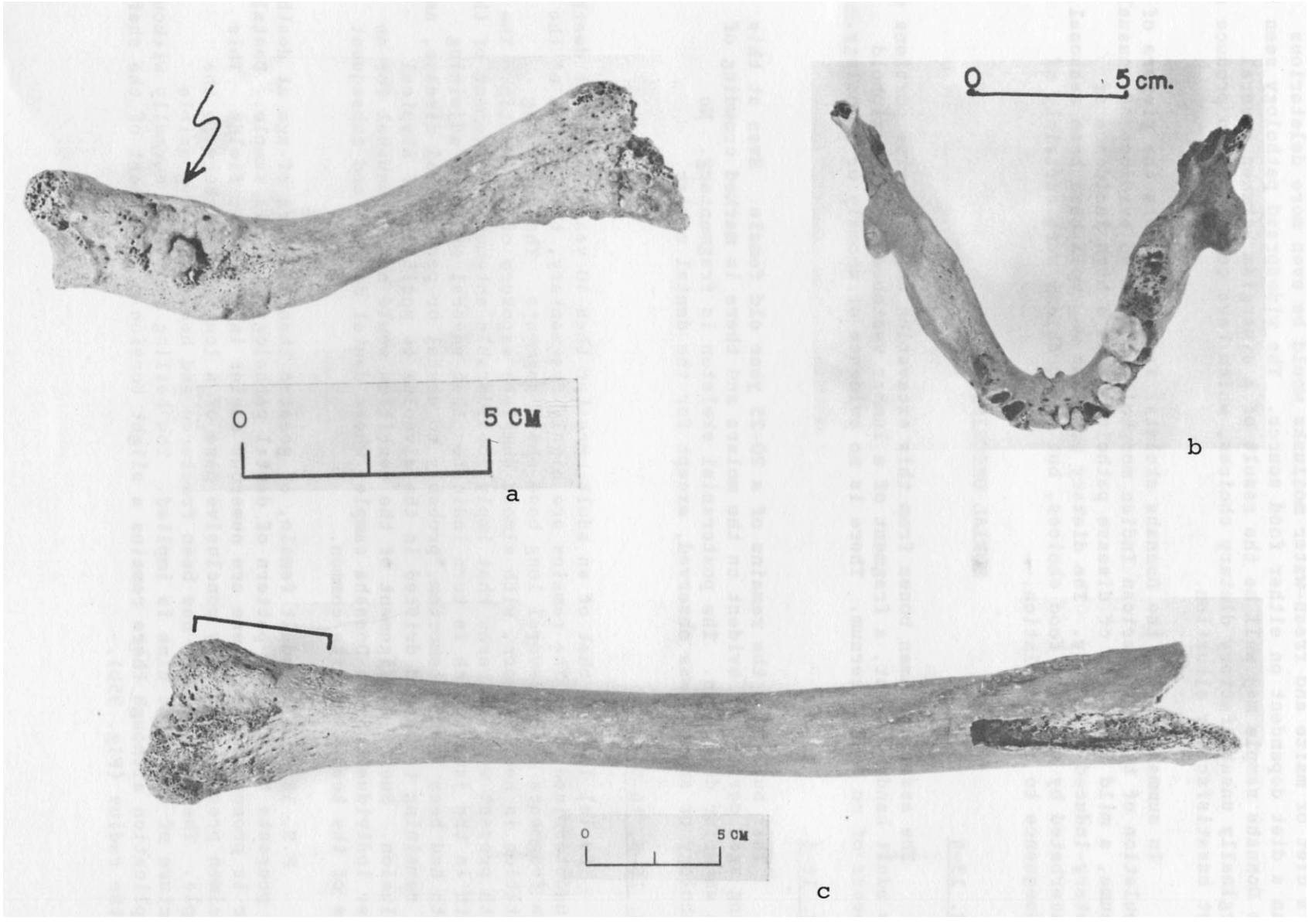


Figure 34. Skeletal pathologies observed at the Donnaha Site include osteomyelitis in a clavicle and tibia, F.S. 34-117 (a,c) and abscesses and peridontal disease, F.S. 34-117 (b). The arrow and bracket indicate areas of lesions.

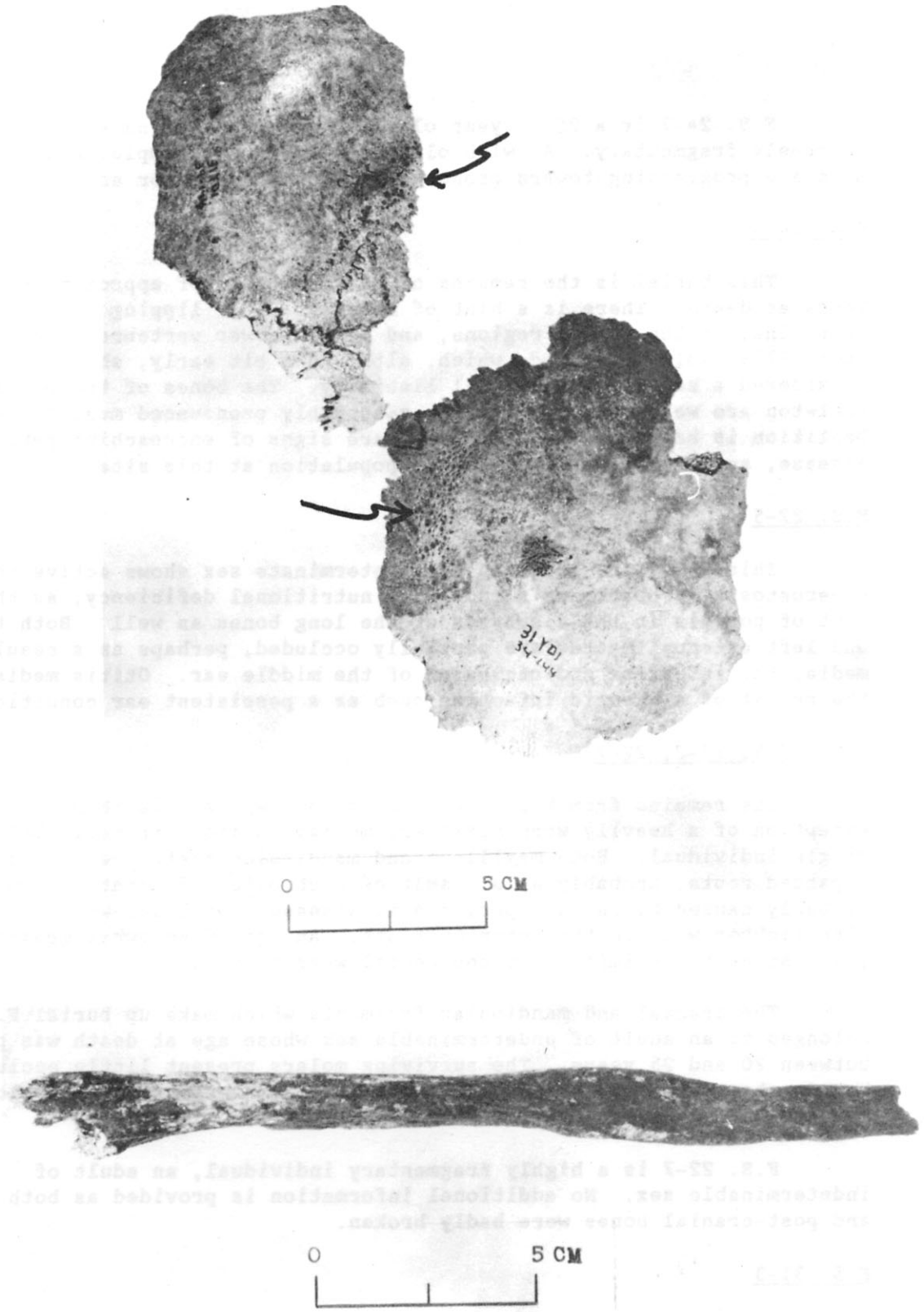


Figure 35. Skeletal pathologies observed at the Donnaha Site also include skull fragments with porotic hyperostosis, F.S. 34-114 (a) (arrows indicate sites of bone structure alteration) and a fractured and healed radius, F.S. 16-9 (b).

F.S. 24-7 is a 25-35 year old adult of indeterminate sex. It is extremely fragmentary. As with older adults in the sample, dental wear is moderate progressing toward pronounced. No pathology or anomaly was noted.

F.S. 24-5

This burial is the remains of an adult male of approximately 25-30 years at death. There is a hint of osteoarthritic lipping on the proximal left ulna, in the tarsal regions, and in the lower vertebral region. The sacro-iliac joint is fused, which, although a bit early, should not be considered a severe pathological liability. The bones of the postcranial skeleton are well marked, implying reasonably pronounced musculature. Dentition is healthy, although there are signs of encroaching periodontal disease, as is true for most of the population at this site.

F.S. 22-5

This 3-5 year old child of indeterminate sex shows active porotic hyperostosis, probably as a result of nutritional deficiency, as there is a hint of porosis in the diaphyses of the long bones as well. Both the right and left external meatus are partially occluded, perhaps as a result of otitis media, the infection and occlusion of the middle ear. Otitis media usually is the result of a chronic infection such as a persistent ear condition.

F.S. 17-5, 17-2, 22-7

The remains from F.S. 17-5 consist of separate teeth which, with the exception of a heavily worn maxillary medial incisor, probably belonged to a single individual. Both maxillary and mandibular teeth are present. All show expanded roots, probably as a result of a chronic inflammation, which was probably caused by chronic periodontal disease. Occlusal wear is variable, with lighter wear in the anterior teeth. An age of somewhat greater than 30 years at death is implied by the dental wear pattern.

The cranial and mandibular fragments which make up burial F.S. 17-2 belonged to an adult of undeterminable sex whose age at death was probably between 20 and 25 years. The surviving molars present little occlusal wear, but do show extensive periodontal resorption in response to chronic periodontal disease.

F.S. 22-7 is a highly fragmentary individual, an adult of indeterminable sex. No additional information is provided as both the cranial and post-cranial bones were badly broken.

F.S. 31-3

This adult male, who was older than 35 years at death, shows well the pattern of ageing represented by the skeletal remains from the site. Dental wear and loss are advanced, with dental calculus evident on the remaining teeth. The vertebral column shows degeneration of the vertebral bodies, with

slight anterior compression of the bodies, and osteophytic development, which is typical of the middle stages of osteoarthritis, obvious on the vertebrae. While no severe disability would have ensued at the stage of osteoarthritis evidenced by this individual, it would not have been many years before serious problems, which might have included vertebral collapse, would have occurred. The dental condition of this individual was progressive and would almost certainly have resulted in the loss of the remaining teeth.

F.S. 31-2

This adult female, who was probably aged 25-30 years at death, is quite fragmentary. Other than rather severe dental attrition and loss, no doubt associated with the carious condition of the remaining molars, there is very little remarkable about this burial.

F.S. 27-2

This male skeleton, who was between the ages of 20 and 25 years at death, shows the poor dental condition which is typical of the remains from the site, with caries in the premolar and molar regions and moderate dental wear. Further inferences are made difficult by the fragmentary nature of the burial.

F.S. 28-2

This small male, aged approximately 30 years at death, presents an interesting anomaly--an Inca bone (Brothwell 1981:91). The lambdoidal region of the cranium shows extensive resorbed porotic hyperostosis. No other pathology or anomaly is visible.

F.S. 32-1

This male of more than 35 years of age at death carries the dental problems of this sample to their conclusion. In addition to substantial dental wear, there are several abscesses in the mandible and several teeth have been lost antemortem. The right horizontal mandibular ramus presents a possible healed mandibular fracture. Alternatively, and somewhat more likely, the condition may be the result of a recovered and partially resorbed perforated premolar abscess. The vertebral column shows lumbarosteoarthritis and possible collapse of the lumbar vertebral bodies.

F.S. 34-28

This adolescent skeleton, which may have been male, is essentially complete but damaged. Dental caries have already occurred in the maxillary premolars. Cranial lesions similar to active porotic hyperostosis are present, implying either anemia or some other metabolic or chronic disease disturbance of bone metabolism. No other evidence of pathology presents itself.

F.S. 34-56

This adult male, who was not much more than 25 years of age at death, may be the best preserved burial from the site. It is also one of the most interesting pathological cases from the collection, demonstrating a condition which is most economically described as chronic nonsuppurative osteomyelitis (Steinbock 1976:76-78). This condition, a chronic infection of the bone by way (usually) of the transmission of Staphylococcus aureus to the epiphyseal regions of the skeleton by the circulatory system, is progressive and almost always fatal, although the progression may take many years. In this particular case, the introduction of the microorganism into the system was most probably the result of dental disease. The right mandibular molars had, in turn, become carious and abscessed, creating pockets of pus and staphylococcus which would have been ingested and circulated. Throughout the skeleton, the bone cortex had abnormally thinned and vertebral bodies in particular had begun to be resorbed, encouraging the imminent anterior collapse of the lumbar vertebral bodies. The degenerative changes induced by the pathology led, initially, to an improper overestimate of age, but the lack of dental wear and the generally youthful appearance of the skeleton in regions which are not pathological have led to the current age determination.

F.S. 34-117

This well preserved skeleton of a 40-50 year old male shows clear evidence of a well developed chronic pyogenic osteomyelitis (Steinbock 1976:74). The osteomyelitic lesions are found throughout the postcrania and there is cranial periosteitis which may well have been associated with the general skeletal pathology. Damage to the clavicle and the distal portion of the tibia is seen in Fig. 34a,c. As in the case of F.S. 34-56, the most likely infectious organism is Staphylococcus aureus, probably originating in the numerous dental abscesses and periodontal disease which characterize this individual (Fig. 34b).

F.S. 34-118

This female, aged 30-40 years at death, shows the typical pattern of severe dental wear and antemortem loss which is present in the adults from this site. Caries are common in this individual, involving all fields of the dentition and no doubt having been the cause of the antemortem tooth loss. There are resorbed cranial lesions which may have been associated with a particularly severe disease episode or with a transient systemic infection engendered by one of the dental abscesses which led to the tooth loss.

F.S. 34-143

This skeleton of a young adult (18-20 years) male shows no striking pathology or anomaly, although there is evidence of resorbed cranial porotic hyperostosis, of unknown etiology.

F.S. 34-144

This child of approximately 2 years of age and indeterminate sex presents an active case of porotic hyperostosis (Fig. 35a). The etiology in this case is almost certainly anemia, due either to dietary or infectious causes (Phillips and Weaver 1979). Given the number of apparently recovered cranial lesions in the rest of the sample from the site, this case is not considered remarkable.

F.S. 34-166

This adult female presents the typical pattern of dental disease and osteoarthritis known for all adults from the site. Age at death is problematic for this individual, although it was probably in excess of 40 years. In particular, the left maxilla shows evidence of severe periodontal disease and antemortem tooth loss. The postcranial skeleton, especially the vertebral bodies, show degeneration and considerable loss of bone density. The cranium shows resorbed lesions, which are either a response to a metabolic imbalance or further evidence of osteoporosis, the loss of bone density due to ageing, which is most pronounced in postmenopausal females.

F.S. 34-4

This burial consists of the fragmentary cranial and femoral remains of two adults. The confused context of the burial and the similarity of the remains makes it impossible to offer any additional information concerning the burial.

F.S. 37-6, 37-7

F.S. 37-6 is an isolated partial cranium, probably that of an adult male. There are no salient features for discussion. F.S. 37-7 is a badly damaged, fragmentary skeleton of an adult, sex indeterminate, with no obvious pathology or anomaly.

F.S. 39-5

These fragmentary remains of an adult of indeterminate sex presented no evidence of anomaly or pathology, other than the slightly inflated proximal fragment of a left clavicle, which might imply either trauma or some mild infectious process.

F.S. 36-3

The skeletal remains from this excavation unit represent two distinct individuals, an adult of more than 30 years at death, and a child of from 1 to 1-1/2 years of age. The fragmentary remains of the child exhibit no anomalies or pathologies. The very fragmentary remains of the adult represent the appendicular and axillary skeleton, as well as the facial and dental skeleton. The only notable pathology is a slight osteoarthritic lipping of the right patella. The dentition is generally heavily worn.

F.S. 36-9

The fragmentary remains of the right foot, an unsided portion of femoral shaft, a lumbar vertebra, and several rib fragments constitute all that remains of this adult of undetermined sex. There are no anomalies or pathologies seen in this individual. Evidence that this burial had been severely disturbed after interment is available in the presence of the right first rib and a costal rib fragment of a late-term fetus in the burial. As the adult remains could not be sexed, the relevance of the fetal bone fragments to the adult cannot be established.

F.S. 36-7

Two individuals are represented in the fragmentary remains from this excavation unit. An infant of approximately one year of age at death is represented by two deciduous tooth crowns and a fragment of femoral shaft.

The other individual is represented by the very fragmentary remains of portions of most of the skeleton of an adult of undetermined age and sex. The dentition shows heavy occlusal wear and the inflammed roots which are often characteristic of chronic periodontal disease. A very large third molar, which may be from another adult, shows little wear but manifests a large occlusal caries. There are no postcranial pathologies or anomalies in evidence.

F.S. 38-5

This burial is the remains of a child of 1-1 1/2 years of age at death which shows no evidence of pathology or anomaly.

F.S. 38-6, 38-9, 38-11

F.S. 38-6 consists of the adult long bones (humerus, radius, ulna, tibia, and fibula) of a single individual. No pathology or anomaly is evident.

F.S. 38-9 is the remains of an adult female. The dentition is well worn and caries are present on the molars.

F.S. 38-11 is the combined remains of a minimum of four adult individuals, making any more specific statements difficult. The various teeth show caries and rather extensive wear, as would be expected for individuals of this sample. No pathologies or anomalies were noted.

F.S. 36-19

This young adolescent individual (12-14 years of age) of indeterminate sex is fragmentary, making detailed inference difficult. The cranial fragments do present evidence of active porotic hyperostosis, however, implying a disease or dietary stress.

F.S. 40-9

This child, of indeterminate age and sex, is highly fragmentary. The cranial remains do show evidence of resorbed porotic hyperostosis, which is widely taken to represent the effects of chronic anemia (El-Najjar 1976).

F.S. 40-13

This adult female, represented only by postcrania, may have been older than 35 years, judging by the presence of osteophytic lipping on the anterior bodies of the remaining lumbar vertebrae. The fragmentary condition of most of the bones prohibits further conclusions.

F.S. 40-10, 40-12

The remains of the adolescent (40-10) are in very poor condition, precluding analysis beyond the observation that the alveolar regions of the skull showed evidence of substantial periodontal disease, in spite of the relative youth of the individual.

F.S. 40-12 is an adolescent female, represented by cranial and postcranial remains. Dental caries already are present in the maxillary and mandibular molars, reinforcing the impression of very poor dental health in the occupants of this site. A supernumerary tooth is present in the maxilla in the incisor field.

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