

Middle Woodland Procurement, Processing and Use of Anadromous Fish in the Delaware Valley: Contributions From a Living Archaeology Experiment

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Project Summary

Archaeological evidence suggests that a major shift in economic focus toward intensified procurement of anadromous fish occurred in the Middle Atlantic region between the Terminal Archaic and Middle Woodland periods (Cavallo, 1987; R. M. Stewart, 1999; Wall, Stewart, Cavallo, & Busby, 1996; Williams & Thomas, 1982). While this has been linked to environment and sea levels, active technology, social interactions and complexity (Cavallo, 1984, 1987; Custer, 1984, 1989, 1996; Dent, 1995; Kraft, 2001; H. Stewart, 1977; R. M. Stewart, 1999) virtually none of the assumptions concerning procurement and processing strategies employed, the quantity of food that could have been acquired and stored, and to what extent this food source significantly increased the amount and stability of the food supply have been tested. In order to more fully understand the implications of this subsistence shift, we need to comprehend the corresponding technological and practical realities of this presumed intensification of subsistence production. The proposed research supplements traditional methods of interpretation by attempting to understand the physical and cognitive processes that were involved in the production of the archeological record. These processes include (1) procurement of materials (2) production, curation and use of tools, and (3) the rationale behind their eventual abandonment. This requires the use of an experimental archaeological approach that investigates these processes and products through the formation and testing of hypotheses based upon the archaeological, ethnographical and historical records. Hypotheses are then tested within the context of a structured scientific experiment by using the same materials, techniques, and strategies believed to have been employed in the past. Finally, the data generated from these experiments is used to support and/or refute current, and possibly to develop new interpretations.

This proposal seeks to employ an experimental archaeological approach to investigate the influence of the procurement, processing and use of anadromous fish on the technological and social changes in the Delaware Valley during the Middle Woodland period. The specific research inquires include:

- 1) What technologies (e.g. procurement of material, design and manufacturing processes) may have been employed in the production of the tools and other material culture of these people?
- 2) How effective and efficient were these tools for the procurement, processing and use of anadromous fish and related activities of daily life?
- 3) What is the relationship between effort (e.g. energy expended) and nutritional return regarding the procurement, processing (e.g. drying, storage, oil rendering), and use as a resource?
- 4) Do the results of this study support or refute the existing interpretations regarding the intensified procurement of anadromous fish in the Delaware Valley during the Middle Woodland period?

To address these questions a variety of research strategies are proposed that include a combination of qualitative and quantitative methodologies. This project has been planned over a 20-month period beginning in the summer, 2003. The research is designed in five phases that represent the following:

Phase I: Baseline Data Formulation: Archaeological, Ethnographical and Historical Data

Phase II: Procurement of Natural Resources and Production of Tools/Material Culture for Experiments

Phase III: Anadromous Fish Procurement: Design, Construction and Implementation of an Experimental Fish Weir

Phase IV: Anadromous Fish Procurement, Processing and Use: Living Archaeological Field Experiment:

Phase V: Data Analysis: Qualitative and Experimental Research Findings

It is expected that this research project will have a significant influence on the interpretation of the prehistoric life in the Delaware Valley. Through the use of experimental research methods, the findings of this study will enhance our understandings by the generation of new information as well as the re-evaluation of our current knowledge. There are additional advantages and outcomes of this project that are benefits of an experimental archaeological approach. These include improved fieldwork and strategies for interpreting archaeological sites as a result of insight from the actual manufacturing and use of material culture as these relate to formation processes. Furthermore, this research project includes the development and documentation of a "living archaeological site" resulting from the use and maintenance of tools and execution of experimental research. This presents a unique opportunity for future archaeological investigations through (1) direct observation of site formation processes over time; (2) future blind excavation and interpretation of the experimental site; and (3) on-site visitation by scholars and the public.

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Project Description

Introduction

This research initiative proposes to study the relationship between the procurement, processing and use of anadromous fish and the corresponding technological and social changes in the Delaware Valley during the Middle Woodland period for the purposes of gaining a better understanding of past. The Middle Woodland was chosen to be the focus of this study because the most intensive exploitation of anadromous fish in the Delaware Valley seems to have occurred during this time period. This research will focus on the following questions:

- 5) What technologies (e.g. procurement of material, design and manufacturing processes) may have been employed in the production of the tools and other material culture of these people?
- 6) How effective and efficient were these tools for the procurement, processing and use of anadromous fish and related activities of daily life?
- 7) What is the relationship between effort (e.g. energy expended) and nutritional return regarding the procurement, processing (e.g. drying, storage, oil rendering), and use as a resource?
- 8) Do the results of this study support or refute the existing interpretations regarding the Middle Woodland intensified procurement of anadromous fish in the Delaware Valley?

To address the above research inquiries, this project will employ (1) archaeological, ethnographical and historical research to identify a range of behaviors associated with the procurement, processing and use of anadromous fish; (2) an experimental research approach based upon the application of the scientific methodology to isolate specific behaviors that best fit the Middle Woodland Delaware Valley; and (3) data analysis to support, refute and/or provide new interpretations of the Middle Woodland procurement, processing and use of anadromous fish in the Delaware Valley.

Geographic and Environmental Background

The Delaware Valley is located in the Middle Atlantic region of the United States and cuts through five physiographic provinces including the Coastal Plain, Piedmont, New England, Valley and Ridge, and Appalachian Plateaus. It encompasses more than 12,700 square miles and includes parts of Pennsylvania, New Jersey, New York, and Delaware (USGS, 2003, pg. 1). Parts of the Delaware River are tidally influenced with the current head of tide located near Trenton, New Jersey at the transition from the Coastal Plain to the Piedmont (USGS, 2003, pg. 1). This area has been home to Native Americans, collectively referred to in historic times as “the Delaware,” for over 12 thousand years (Custer, 1996; Kraft, 2001). One of the attractions of the Delaware Valley is that it possesses many exploitable resources, most notably a variety of anadromous fish. These species include American shad (*Alosa spidissima*), Atlantic sturgeon (*Acipenser oxyrinchus*), shortnose sturgeon (*Acipenser brevinostrum*), alewife (*Alosa pseudoharengus*), and blueback herring (*Alosa aestivalis*) (R. M. Stewart, 1999).

Anadromous fish, salt-water fish that seek fresh water to spawn, represent an “incredibly predictable and productive resource that could withstand intensive exploitation. Not only the flesh of the fish, but the oil that they contain (especially herring species) are useful” (R. M. Stewart, 1999, pg. 2). These fish have the unique capability of living in both fresh and salt water through osmoregulation. Each year large numbers of anadromous fish leave their salt-water habitats to spawn in those fresh water environments in which they were born. This phenomenon occurs on a highly predictable schedule thereby providing a perfect opportunity to employ communal fishing strategies. Common communal fishing activities include the use of nets and weirs.

Although anadromous fish are a predictable resource, there is variability in patterns of behavior between the different species. The behaviors of individual species of anadromous fish influence the timing, location and strategies necessary for their successful procurement. The behavior of shad in the lower Delaware Valley illustrates this correlation. One peculiar behavior Shad exhibit is their propensity to congregate when faced with any obstacle such as bridge supports or rapids (McPhee, 2002). Although Shad typically remain within the main channel of a riverine system, a drastic drop in depth of the Delaware River near Trenton, New Jersey creates Shad congregation.

Adjacent tributaries offer a temporary escape for these fish (Kraft, 2001). These tributaries provide a more optimal location for the procurement of anadromous fish than the main river channel because they are narrower and shallower yet still experience an approximately seven-foot change in tide (NOAA/NOS, 2003, pg. 4). Consequently, it has been postulated that these portions of the lower Delaware Valley are particularly well suited for an intensive procurement of shad using prehistoric fishing methods (Kraft, 2001). Accordingly, Phase III of the proposed research (Anadromous Fish Procurement: Design, Construction and Implementation of an Experimental Fish Weir) will be located in one of these locations, Crosswicks Creek, NJ.

The Archaeology of Fishing and the Middle Woodland Period

Stewart (1999) summarizes the history of the growing reliance on the use of anadromous fish within the Delaware Valley. Early settlement patterns (circa 6000 B.C.) indicate an emphasis on the use of riverine and wetland habitats. Around 3000 B.C., evidence suggests that fishing and shell fishing gained importance. This is inferred through archaeological evidence including “cyclical reuse of specific habitats and sites” and “from the locations of some sites adjacent to ideal fishing habitats and the occurrence of large, fire-altered rock platforms representing the probable remnants of smoking, roasting and boiling activities.” (Cavallo, 1987, cited in Stewart, 1999). The Middle Woodland period is thought to represent the most intensive use of anadromous fish by the prehistoric inhabitants of the Delaware Valley (Cavallo, 1984; Custer, 1989; R. M. Stewart, 1999).

Interpretations based upon material culture and its context at the Abbott Farm National Landmark, Trenton, New Jersey, support the inference that there was an intensification of the procurement, processing, and use of anadromous fish beginning during the Late Archaic period (circa 3000 BC – 1000 BC) and lasting through the Middle Woodland period (ending circa 800/900 AD). Supporting evidence is outlined as follows and is drawn from a variety of sources (Byrne, 1984; Cavallo, 1984, 1987; Cross, 1956; Custer, 1996; Kraft, 2001; R. M. Stewart, 1982, 1994, 1999; R. M. Stewart & Cavallo, 1983; Williams, Parris, & Albright, 1981; Williams & Thomas, 1982):

- Remains of Atlantic Sturgeon and American Shad on sites situated in environments well suited to the procurement of anadromous fish;
- The resource potentials of the environmental settings in which sites containing artifacts and facilities that may have functioned in fishing and fish processing occur; the size and depositional intensity of such sites;
- Numerous and extensive fire altered rock features located in environmental settings conducive to fishing and where they may have served as facilities for the processing of anadromous fish (e.g., drying, smoking, roasting, and boiling);
- Appearance and relative frequency of stone artifacts interpreted as net weights, and the presence of nets as indicated by surface impressions found on pottery;
- A variety of other tools and implements which have been related theoretically to fishing and related activities including: Fox Creek and Petalas bifaces (hafted cutting tools used in fish processing and maintenance of fishing equipment), adzes (weir construction and maintenance activities), soapstone bowls and large pottery vessels (processing, storing, and using fish and/or fish oil), and bone harpoons, and;
- High levels of strontium (Sr) found in human remains and site sediments which relate either to a diet high in marine products and/or the diagenetic enrichment of bones and site sediments with fish oil and/or decayed remains of fish.

This experimental research will evaluate the current interpretation of the archaeological record and provide a basis from which further inferences will be constructed. To date, no practical evaluations of the procurement and processing strategies employed, energetic efficiency of the activity, the quantity of food that could have been acquired and stored and to the extent this food source significantly increased the amount and stability of the food supply have been attempted.

Experimental archaeology has the potential to further deepen our understandings regarding the use of anadromous fish as a resource during the Middle Woodland period in the Delaware Valley. For example, data generated through this experimental research includes both information involved in procurement of large numbers of anadromous fish and the estimates on the number of fish that can be processed by a certain size labor force within a

specific period of time. An increased understanding of such a potentially valuable resource to the Indians of the Delaware Valley is an essential step in attempting to appreciate the impact it may have had on society. As evidenced in the prehistoric societies of the northwest coast (Ames, 1994), the exploitation of anadromous fish can invoke distinct divisions of labor and increase social complexity.

Experimental Archaeological Research

Experimental Archaeology is defined as “that branch of archeology which seeks to interpret material culture, technology, or lifeways of the past by means of structured, scientific experimentation.” (Callahan, 1995:3). “If experimental archaeology can improve the recognition and evaluation of the evidence, it has made a fundamental contribution to the process of archaeology as a whole” (Reynolds, 1979). Several experimental archaeologists have made major contributions to our understanding of the past and will serve as models for this project. They include: Errett Callahan (Callahan, 1981, and various), Hans-Ole Hansen (Hansen, 1964), Horreus de Haas (de Haas, 1978), John Coles (Coles, 1973, and various), Peter Reynolds (Reynolds, 1976, 1979), Kathy Schick and Nick Toth (Schick & Toth, 1993, and various) and Bell et al.(Bell, Fowler, & Hillson, 1996). Through the efforts of these pioneers, experimental archaeology has, and continues to be, a viable research tool that complements archaeological interpretation thereby extending archaeological research capabilities beyond inference towards more valid conclusions. Currently, the vast majority of experimental archaeological research is taking place in Europe; there are limited examples of this type of research being conducted within the United States.

This experimental research is divided into the following steps:

- (1) Generate a list of activities people engage in when exploiting anadromous fish. This list will be created through the use of archaeological interpretations combined with historic and ethnographic data from the Delaware Valley, Northwest Coast, Northeast and Southeast.
- (2) Replicate relevant material culture to be used in experimentation by using the same materials, techniques and strategies employed in the past.
- (3) Test the range of activities within the context of the Delaware Valley using the replicated material culture in a living archaeology experiment.
- (4) Use the data generated from experimentation to re-evaluate current interpretations.

Proposed Research

To address the research issues detailed above, several strategies will be employed. Initially, a combination of historic, ethnographic, and archaeological research methods will be implemented to generate a list anadromous fish procurement, processing, and use strategies utilized throughout prehistoric and historic North America. The experimental aspect of this research utilizes quantitative (measurement of time, efficiency and energy) methodologies that will be implemented to test these strategies and narrow down the range of possibilities applicable for the Middle Woodland Delaware Valley with regards to the archaeological record and environmental context. This research is planned over a 20-month period beginning the Summer, 2003. The research is designed in five distinct phases (see Timeline) that represent the following:

Phase I: Baseline Data Formulation: Archaeological, Ethnographical, Historical and Experimental Data

Phase I of this study encompasses baseline data collection. The data collected during this phase will come from a variety of sources including the archaeological record, archaeological interpretations, ethnographic research, ethnographic interviews conducted by this researcher, historical documents and previous experimental archaeological investigations. The primary purpose of the research conducted during this phase is to generate a list of behaviors, interpreted or observed, that are related to anadromous fish exploitation. These behaviors will be tested through experimental archaeology in a Middle Woodland Delaware Valley context.

The Middle Woodland archaeological record excavated and analyzed from the Abbott Farm National Historic Landmark will provide information related to postulated activities regarding anadromous fish exploitation. It will also provide the basis for the tool and feature replication in this experiment. Interpretations based upon the archaeological record from other temporal sites throughout the Delaware Valley will also be investigated. Finally, there is value in the collection and analysis of data from other geographic regions of the United States where the prehistoric inhabitants engaged in similar resource procurement activities (e.g. Northwest Coast, New England,

Southeastern United States). Due to better preservation, in some cases the archaeological record is more intact at these locations (e.g. Boylston Street Fish Weir, Boston, MA (Johnson, 1949)) and is essential to this research.

This proposed experimental archeological research also requires the use of ethnographic strategies that include a focus on the decision-making processes and behaviors that are currently being implemented in the procurement, processing and use of anadromous fish. It must be noted that there are limited number of existing fishing industries providing an opportunity to gain relevant insight for this research. These include the netting technologies of the Pamunkey Indians; Virginia (Mills, 1999); commercial wooden tidal fishing weir in Minis Bay, Nova Scotia (McPhee, 2002); and a variety of Native American Indian tribes of the Northwest coast (Ames, 1994; Schalk, 1977). The Native Americans of the Northwest currently engage in a wide range of fishing activities that represent the procurement, processing and use of anadromous fish. Observation and interview of modern people engaging in these activities will be conducted to gather data that will be used to form a foundation necessary to generate a list of behaviors related to anadromous fish exploitation for later phases of this research.

Historical data has, and will continue to be reviewed throughout this research process. There are two general classes of historical data sets that are particularly valuable to understanding this research: historical documents e.g.(Smith, 1907) and early colonial period art (e.g. John White (Hulton, 1984). Although there are limits in the usefulness of historical data within archeological research, it has provided a rich supplement in the formation of this project.

Analysis of all of the data collected during Phase I will accomplish two goals: (1) generate a list of the numerous potential strategies employed in anadromous fish procurement, processing and use to be tested in later phases, and (2) provide a material culture base that will be replicated and utilized in later phases to test these strategies.

Phase II: Procurement of Natural Resources and Production of Tools/Related Material Culture

Phase II includes the (1) procurement and processing of the natural materials required for; and (2) the production of the tools and related material culture necessary to properly test, the range of behaviors generated from Phase I. Production of these tools will be based upon the relevant Middle Woodland archaeological record from the Abbott Farm Historic Landmark and to a lesser degree other sites from the Delaware Valley. Ethnographic and archaeological data from other geographic areas will be referenced to supplement the poorly preserved archaeological record in the Delaware Valley.

Procurement and processing of natural materials will be an ongoing process for an entire year given that many of the necessary natural materials are only available in their proper state on a seasonal basis. Procurement activities will be accomplished by the use of primitive methods and any necessary processing of materials before production begins will be accomplished. Due to time constraints, some material culture where production from scratch is not necessary to accomplish the goals of this study, but whose presence in the experimental aspects of the research is essential, will be purchased (e.g. antler billets for flintknapping, large quantities of cattail leaves for mats, etc.).

Where applicable, the production of tools will be accomplished solely through traditional means. All flintknapping will be executed utilizing only antler, bone, wood and stone. Pottery will be formed utilizing a coil-method and fired outdoors. Cutting and shaping of wood will be completed through burning and/or implementation of stone tools, etc. Data recorded on the procurement and processing of natural materials and the fashioning of those materials into tools is plays a large role in later data analysis.

The importance of keeping separate the “true” archaeological record and that which was produced and left behind through this experiment is fully realized by this researcher. To compensate, some adjustments will be made in the replicated material culture. Artifacts made from argillite, the most prolific tool stone in the Middle Woodland Delaware Valley, will be replaced by Morrow Mountain rhyolite from North Carolina in tool replication. Those made from local cherts and jaspers will be replicated using exotic Burlington chert. Finally, the surface treatment of ceramics will be highly distinguishable from that contained in the true archaeological record.

Tool Production Data Collection

All procurement, processing and production activities will be recorded within a system for data collection. An adaptation of Callahan’s record keeping methodology (Callahan, 1981) has been developed. This includes pre-printed tool production data sheets in which information regarding procurement, processing and production of tools will be recorded (see Form 1 – Manufacturing Data Card). A catalog numbering system that can articulate, both in documentation and directly on the tool (label), multiple variables (e.g. material, tool type, generalize production

method; manufacturer; and the sequence of production) will be utilized to lessen recording time. All data collection in this phase will be conducted by the Principle Researcher (Doctoral Candidate). In addition, photography and videography will be used to document tool production and will serve to augment analysis efforts.

Phase III: Anadromous Fish Procurement: Construction and Implementation of an Experimental Fish Weir

During phase III, the practical realities of one aspect of anadromous fish procurement will be explored – fish weirs. This phase will take place in Crosswicks Creek, New Jersey. A New Jersey Scientific Collecting Permit and Stream Encroachment Waiver have already been obtained. Due to its excellent location for the placement of a fish weir (as described earlier), all efforts will be concentrated on the construction and monitoring of the weir. Other fishing methods (e.g. nets, line, etc.) will be explored in Phase IV of this research. Based upon archaeological, ethnographical and historical evidence, a wooden tidal fish weir will be designed, and through the efforts of approximately 10-12 people, will be constructed utilizing only primitive tools produced from phase II.

This weir will be created from saplings and brush and arranged in a post-and-wattle form. The weir will be erected across a narrow section of Crosswicks Creek. This is an appropriate location for the construction of a tidal fish weir for three reasons:

- (1) The geographic position of Crosswicks Creek is adjacent to the location where Shad congregate and offers a release for their dispersal.
- (2) A tidal change of 6-7 feet occurs at this location.
- (3) This narrow portion of Crosswicks Creek reduces the necessary length of the weir.

After construction, the weir will be used and monitored for a period of two days that will allow for the observation of the weir in use for four tidal change cycles. All fish collected will be saved and utilized in Phase IV.

Tool Use and Labor Data Collection

A select team of researchers that have been trained in the appropriate data collection procedures will record data pertaining to all aspects of tool use. Labor data will be collected on individual tool use (see Form 2 – Artifact Analysis Card) and the following variables: worker, duration of work, type of work completed, specific tool employed and intensity of labor (see Form 3 – Labor Recording Form). Approximate calories expended in the construction, maintenance and use of the weir will be calculated through correlation of duration and intensity of work. This data will be recorded on pre-printed tool use and labor data sheets; and sustained use of the catalog numbering system will be maintained. All data will be entered into a Microsoft Access database. In addition, all aspects of weir construction and use will be photographed and videotaped using digital equipment. These photographs and videotapes will be used in future educational efforts and serve to augment analysis.

Additional Data Collection

Land surveying techniques will be used to document the exact location of the weir structure and this will be recorded using Topcon Total Station GTS-3B and Prism Pole. Coordinates will be mapped using AutoCad Software.

Phase IV: Anadromous Fish Processing and Use: Experimental Archaeological Field Experiment

In Phase IV is the most rigorous component of this multiphase research project. Accordingly, this phase will commence with a three-week training session for all participants. During this session approximately twelve participants will be introduced to the basic primitive skills necessary to complete the following two-week full-scale experimental archaeology investigation. These skills are basic flintknapping, ceramic replication, primitive wood working techniques, basketry, primitive cooking methods, cattail mat production, and primitive hunting and trapping implement production and use (e.g. rabbit sticks, atlatls, bows, deadfalls, snares). It should be noted that all tools produced prior to this phase were intended for communal use. However, as result of this training, each participant will produce their own personal tool kits (ceramic bowl, bifacial knife, cattail sleeping mat, basket).

Following this training session, all participants will be immersed in an isolated area along the Delaware River for two weeks. At this site, we will live and conduct experiments in a recreated Middle Woodland anadromous fish processing camp. This is not a survival experience; rather, it is a subsistence level research project whereby the proper context that influences the decision making process is created. The only non-natural material that will be present on the site will be recording equipment.

Parallel with the focus on anadromous fish are the requirements of daily life that must be also replicated within this experiment. Therefore, this immersion includes eating only the food postulated to have been consumed during that time, utilizing only the replicated tools from Phase II and IV, cooking in replicated pots, baskets, bowls, etc. over fire, and living in a reconstructed shelter based upon Middle Woodland post-mold evidence. This comprehensive experimental approach makes the data created from this experiment extremely valuable.

All of this effort will provide the necessary context within which the strategies generated during Phase I concerning anadromous fish procurement, processing, and use will be tested. The fish that were procured during Phase III (Fish Weir) supplemented by donations from the Delaware River Shad Fisherman's Association will be utilized for these experiments. Preliminary topics of experiments include: various fish butchering methods, drying methods, oil rendering, glue rendering, cooking whole, cooking in clay, roasting, smoking, cooking in ground, drying and grinding, etc. While on the island, we will also be experimenting with other various forms of anadromous fish procurement including replicated nets, spearing and bone hooks. A Pennsylvania Scientific Collecting Permit is pending.

At the end of Phase IV any material culture we believe would have been further curated by people in the past will be packed out of the site when we leave. The remaining material culture and features will be left behind and exposed to natural site formation processes. Although not within the scope of this investigation, but a goal of the researcher, is that the site be revisited on a periodic basis and site formation processes observed and recorded. In the future, the site will be excavated by archaeologists and interpreted. A correlation between the archaeologists' interpretations and the actual activities that took place will be invaluable to improving both archaeological field methods and interpretations.

Tool Use and Labor Data Collection

The data collection procedures for Phase IV will follow those presented within Phase III.

Additional Data Collection

Land surveying techniques will be used throughout the two-week period to document the important locations, which include activity areas, structures, and material culture distribution. Additionally, the locations of every artifact left behind will be point-provenienced. The following land surveying equipment will be used in this Phase: a Topcon GTS-3B total station and prism pole. The coordinates will be mapped using AutoCad software.

Phase V: Data Analysis: Qualitative and Experimental Research Findings

This phase includes analysis of results, writing of dissertation and publication of results. The data generated by this research will be managed in a Microsoft Access database and, where applicable, analyzed using statistical software (SPSS). The digital photographs and video footage will be edited using Adobe software.

The data compiled from the ethnographic, historic, archaeological, and experimental archaeological research conducted during the course of this investigation will be compared to, and contrasted with, the current interpretations of the archaeological record. This will be accomplished from a practical point of view (evaluation of labor data, tool efficiency, etc.) and comparison of the archaeological signatures created through this experimental research with the "true" archaeological record. Some of the questions the this analysis will help to answer include:

- Is organized group labor necessary for the construction and use of a fish weir?
- Is organized group labor necessary for the amount of fish possible to procure through the use of a weir?
- Is organized group labor necessary for the processing of fish available through the use of a weir?
- What types of techniques preserve fish products for the longest period of time? What's the amount of labor involved?
- Are the archaeological signatures of small group versus large group fishing distinctive?

Answers to these and other questions will be used in conjunction with the archaeological record to evaluate current interpretations of the Middle Woodland procurement, processing and use of anadromous fish in the Delaware Valley. These findings will support and/or refute the current interpretations and quite possibly assist in the development of new ones. Finally, this study will generate information that can serve as proxies for activities related to anadromous fish procurement, processing and use. This information will help to identify sites related to anadromous fish exploitation and result in improved field methods and interpretations.

This research is directed towards the completion of a doctoral dissertation for the Department of Anthropology, Temple University. The results of this research will be disseminated through several publications, presentations at professional meetings, and presentations for the general public.

Research Implications

This research has the potential to advance archaeology and our understanding of the past in several ways. First, through the archaeological, historic and ethnographic research, a list of behaviors related to anadromous fish exploitation will be created. This information is not only useful to this research, but also valuable to anyone undertaking similar investigations throughout North America.

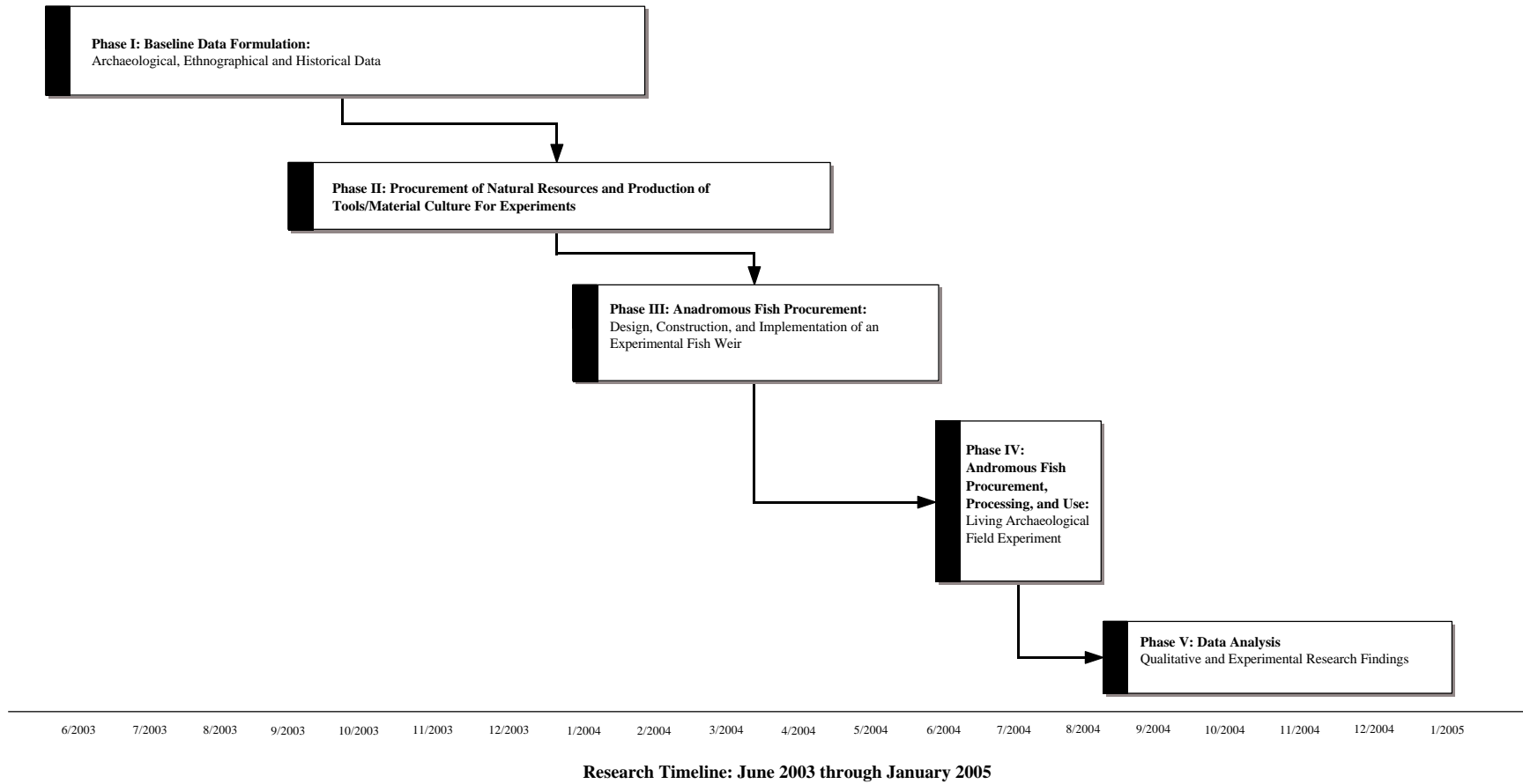
Second, painstaking data recording throughout all aspects of experimentation (tool production, labor, efficiency, etc.) will be used to evaluate the current interpretations of the Middle Woodland procurement, processing and use of anadromous fish in the Delaware Valley. This re-evaluation will serve to support and/or refute current interpretations. Additionally, new interpretations may also result. This will paint a more comprehensive picture of the impact anadromous fish had on the Middle Woodland Indians of the Delaware Valley.

Third, this research will generate information regarding the creation of the archaeological record including location of activity areas, estimates of labor, discarding of waste, use-life and efficiency of tools, etc. This information will help to formulate predictive models and improve archaeological field methods. It is important to note that the vast amounts of data recorded during this study will also provide important information concerning activities not necessarily related to anadromous fish exploitation. Data pertaining to stone tool efficiency, foraging routes, meal preparation in ceramic pots, etc. are relevant to many archaeological investigations.

Fourth, a by-product of this research will be the production of a "site." The site formation processes acting upon this site will be periodically observed over time. Eventually, this site will be blindly excavated and interpreted by archaeologists. Their findings correlated with the records kept during the production of the site will result in improved field and interpretation methods.

Finally, it is the hope of this investigator that this research will illustrate the potential that experimental archaeology has to offer archaeology. Despite the efforts of a few dedicated experimental archaeologists, experimental archaeology as a viable research tool did not "catch on" in the 70's and 80's (Watts, 2002). More recently, however, there has been an increased interest in experimental archaeology by archaeologists in the United States. It is now time for experimental archaeology to be widely accepted and utilized in order to contribute as much to archaeology in the United States as it has been doing in Europe for decades.

Timeline



Forms 1 & 2

MANUFACTURING DATA CARD	
1. Date Completed-	2. Name-
3. Class-	4. Material-
5. Type-	6. Kind-
7. Unit #-	8. Code #-
9. Raw Material-	
10. Tools Used-	
11. Techniques Used-	
12. Time-	
13. Quality-	
14. Hafting-	
15. Carrying Device-	
16. Illustration-	
17. Other-	

ARTIFACT ANALYSIS CARD	
1. Date-	2. Name-
3. Tool Type-	
4. Modification-	
5. Uses-	
6. Variables: a. Material-	
b. Edge-Angle-	
c. Length of Edge-	
d. Objective Piece-	
e. Functional Motion-	
f. Work Time-	
7. Efficiency-	
8. Wear-	
9. Recommendations-	
10. Other-	

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