

ZOOARCHAEOLOGY AT INDIANA UNIVERSITY: THE PAST, THE PRESENT, AND THE FUTURE

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Zooarchaeology, variously called ethnozoology, faunal ethnology, and archaeozoology, refers to the identification and analysis of animal remains recovered archaeologically as a means of understanding relationships between man and his zoological environment. Zooarchaeology is said to have had its origin in North America in the 1860's, but only in recent years have related articles become more common in the literature. The early years from the late 1860's to the early 1950's was a time of practice, testing, evolution, growth, and expansion of the field. Animal bone fragments *per se* held little interest for either archaeologists or for exhibit visitors. They also occupied large amounts of storage space, and thus it was commonplace to discard them on the waste piles during excavation with only minimal mention in the field notes. This usually consisted of a 'laundry list' of species found and relegated to the appendix of an archaeological report. Little attempt was made to actually interpret the data.

Biologists and zoologists seldom had more than a passing acquaintance with the skeletal aspects of the multitude of vertebrate species in their own geographic area of study, much less those of some distant area. Adequate comparative materials were few and far between and often unavailable because of time restraints and travel expense.

During the early twentieth century, some promising attempts were made to identify worked bone to species level and skeletal element. Food resource species, bone artifacts, and their probable manner of usage were described. This was a new and significant approach. Some of these ideas and procedures, which helped to further the field of zooarchaeology, are briefly mentioned below.

Wintemberg (1919) foresaw the future importance of zooarchaeology and pointed out the value of archaeological remains to the zoologist as a means of providing information on range expansions and contractions, environmental adaptations, morphological variations, extinctions, and pathologies. His suggestions, too advanced for the time, were not widely accepted, and many archaeologists still looked on faunal remains as lacking significant data potential.

One of the important early zooarchaeological works was the publication of Loomis and Young (1912) in which they attempted to identify all faunal material to species level and bone element. Descriptions of butchering methods, site seasonality (a new concept), dietary significance, and observations on types of dogs found were presented in the form of charts for the first time.

The first site-comprehensive report was Baker's (1923) attempt to synthesize an overall dietary analysis with interpretations of aboriginal use. Bockelman (1936,1937) proposed that archaeologists save all marine shell fragments, in anticipation of possible reconstruction of primitive trade routes. This was reinforced

by Hargrave's (1938) plea, with well-expressed justifications, for archaeologists to preserve all bone material.

The 1930's were a time of numerous massive excavations conducted through government support, most noticeably through the Works Progress Administration (WPA). This support enabled Glenn A. Black to pursue extensive excavations at the Angel Site in southern Indiana. Unfortunately, little was published dealing with faunal specimens recovered during these excavations.

In the late 1940's, Taylor (1948) stressed the importance of accurate cultural analyses and encouraged archaeologists to collect and analyze more faunal material. Zooarchaeologists continued to systematize their methods by presentation of tables, by listing of species by archaeological unit, and by attempting to understand the sources, manufacturing techniques, uses of mundane, exotic and ceremonial artifacts, butchering methods, seasonal habitation patterns, hunting methods, and environmental changes.

The dearth of adequate collections of comparative skeletal specimens had long hampered accurate and complete analyses, but eventually zooarchaeologists began to build extensive collections of comparative skeletons and to publish handbooks and guides to animal bone identification. Lawrence (1951), Olson (1960), Gilbert (1980), Gilbert, Martin, and Savage (1981), Brown and Gustafson (1979), and White (1952,1953,1954,1955) published on butchering methods, meat yields, and species importance. Guilday (1958,1963,1969,1970), Olsen (1964), and Parmalee (1959,1960,1965,1968,1973) together and separately published a large number of papers describing identifications they were able to make through the use of their own large comparative collections. However, faunal analysis data were still not generally incorporated into archaeological reports.

In 1969, Howard Winters' use of an integrated interdisciplinary approach to obtain an ecological interpretation of the Riverton Culture was followed by numerous papers making similar use of integrated sciences. At the same time, other researchers were examining, critiquing, and improving zooarchaeological methods, theories, and ideas.

The early 1940's saw the beginnings of zooarchaeology in Indiana. Glenn A. Black believed that the large number of bone fragments being excavated at the Angel Site should be used to extend our understanding of that prehistoric culture. With this in mind, he began a rudimentary comparative collection by saving several dozen bones previously identified by Bob Goslin at the Ohio State Museum. Aware of Adams' interest in both animals and bones, Black, with the approval of Eli Lilly, encouraged Adams to spend part of his field survey time in the collection and preparation of a comparative collection that could be used to identify excavated bone fragments. At that time, there were only a few individuals in the United States engaged in identification and interpretation of archaeological faunal material. Black subsequently requested Adams to undertake a study of the Angel Site faunal assemblage. Additional emphasis was placed on recovery and preservation of all bone fragments from Angel Site. Since that time, there have been several small reports written on the identification of Angel Site faunal material (Adams, 1949, 1950), but a significant portion of the bone fragments has yet to be identified.

Over the next two years, a considerable amount of Adams' time was spent collecting faunal specimens through fishing, hunting, and trapping in Warrick,

Vanderburg, Perry, Posey, Monroe, Owen, and Brown Counties. Additional animal carcasses were obtained from other trappers, fishermen, hunters, pet shops, zoos, and roadkills. In the beginning, these specimens were processed by cooking in a caustic lye solution either on a backyard fireplace at home or on a hot plate in the Angel Site laboratory.

In 1947, Adams returned to Bloomington to pursue graduate work, teach anatomy, and continue to enlarge and develop the collection. Summer vacations of three to twelve weeks, spent in northern Minnesota, enabled the acquisition of hundreds of specimens, many representing species rare or absent at that time in Indiana, such as deer, bear, wolf, coyote, porcupine, and beaver, as well as numerous bird species found in Indiana only during rather brief spring and fall migrations. Additional collecting was carried out in the Arctic, Arizona, Missouri, and Illinois.

Especially encouraging during the early development of the Zooarchaeology Laboratory at Indiana University were Barbara Lawrence of the Peabody Museum, Bob Goslin of the Ohio State Museum, Paul Parmalee of the Illinois State Museum, John McGregor of the University of Illinois, Clara Bartlett of the Museum of Northern Arizona, Ken Kidd of the Royal Ontario Museum, Georg E. Neumann of Indiana University, and Eli Lilly of the Indiana Historical Society.

Adams' appointment to the faculty of the Department of Anthropology in 1955 was accompanied by the move of the laboratory from the basement of his home into an old house just off campus and shared with physical anthropologist Georg K. Neumann. Here, the laboratory was furnished with electric hot plates, a sink, an old ice cream freezer, shelving, and several library tables for layout work. A large number of specimens were processed during the 1955–1962 period through the efforts of many students who contributed countless hours of volunteer effort.

In 1962, the laboratory was again moved; this time to the third and fourth floors of Rawles Hall, quarters recently vacated by the Geography and History Departments. A large wet lab with exhaust fan, sink, freezer, and work table was set up on the fourth floor. Here, comparative skeletons were prepared by cold water maceration, a time consuming process which consisted of immersing an animal carcass in cold water and letting it decompose with a change of fresh water every two or three days. In the late 1970's, use of hot water baths accelerated the processing of specimens but also generated even more unpleasant and copious odors, occasionally forcing temporary evacuation of many offices in the building. It was later realized that, through an engineering oversight, the room exhaust had not been vented to the outdoors. Instead, it emptied into an attic area, where odors were quickly picked up and distributed by the general air ducting of the building. Various changes and improvements took place through the years but only recently, with installation of 'state of the art' air handling equipment, have they proved adequate to solve the odor problems.

Now, all odor-producing procedures are routinely carried out in one of the two eight foot laboratory fume hoods, which are exhausted through a hydraulic scrubber/filter. The system is automatically balanced to provide for adequate make-up air. Each hood contains a sink and heavy duty disposal, although most waste must be frozen for later incineration.

The Laboratory currently houses a large collection of disarticulated skeletons of mammals, birds, reptiles, amphibians, and fish, which are used to teach faunal osteology and for identification of large assemblages of skeletal fragments recovered from archaeological sites. While the collection currently includes few articulated skeletons, the number continues to grow annually through various student projects. Through the years, the Zooarchaeology Laboratory's comparative collection has grown to over 4,600 vertebrate specimens and some 110,000 invertebrate specimens, many of which are no longer readily available for collection purposes due to extinction or endangerment. It is one of the larger comparative collections in the United States devoted to zooarchaeological analysis and available for both teaching and research.

The collection is continually being enlarged to make skeletal series demonstrating species, age, sex, individual, and pathological differences available to researchers. The efforts of the laboratory personnel (both paid and volunteer) have long been limited to processing the increasing numbers of newly acquired specimens, while comparatively few monetary resources have been directed toward curation and conservation of specimens previously processed. In recent years, the comparative collection has shown increased signs of deterioration due to this long-term financial neglect. This has resulted in visible degradation of numerous specimens and containers, mildew and mold formation, insect infestation, cracking and crushing of specimens, and loss of label information regarding skeletal specifics making it very difficult to maintain an update of the manual catalog system.

The laboratory is also hampered by inadequate work and storage space, a fourth-floor location with no elevator, and insufficient monetary resources to hire the needed technical help or buy necessary supplies. Additionally, specimens are currently stored in a wide range of makeshift containers including small plastic jewelry boxes, shoe boxes, apple boxes, medicine vials, and everything in between.

In view of the numbers and sizes of animals made available by conservation agencies, zoos, and sportsmen, the present fourth floor location of the laboratory has become increasingly inconvenient. Currently, specimens of 50 lbs to 300 lbs (such as deer, polar bear, zebras, tigers, sheep, goats, wolves, and pythons) have to be carried up the stairs to the dissection laboratory, and subsequently, entrails, flesh, and skins carried back downstairs for transport to an incinerator across campus. These physical restrictions have necessitated the refusal of several large and valuable animal carcasses, which were needed to fill gaps in the collection.

Two academic classes are offered to introduce students to the field of zooarchaeology, and a third class examines the many uses of fauna and flora by aboriginal groups. Additionally, students may enroll in research and reading classes to pursue special research interests.

The large number of skeletal identifications (Adams, 1949, 1950, 1980, 1981; Adams, *et al.*, 1987a,b,c,d) from prehistoric and historic archaeological sites and the forensic identifications that the Laboratory is requested to perform each year by law and wildlife enforcement agencies, farmers, construction contractors, and private individuals present a tedious and time consuming process, but one that provides valuable practical experience for students. Future plans for the Zooarchaeology Laboratory at Indiana University call for a number of changes:

1. Computerization of the laboratory's catalog and related specimen information on a database management system in the immediate future will

permit the collections to be more readily accessed by interested researchers and laboratory personnel. Also, database computerization of faunal assemblages, as they are identified and analyzed, will allow faster and more accurate manipulation of data and will consequently result in more timely report production.

2. The grossly inadequate physical environment of the laboratory will be greatly improved in a proposed move, scheduled for the summer of 1990, to a newly renovated facility. This move should allow more rapid and efficient preparation of comparative specimens (including large ones), an improved capability for zooarchaeological analyses, and a much improved teaching environment.
3. The proposed move should eventually permit a staff increase with the opportunity for more broadly based zooarchaeological research and publication. This proposed upgrade will enable the ultimate establishment of a zooarchaeological institute at Indiana University.

LITERATURE CITED

- Adams, W.R. 1949. Faunal remains from the Angel Site. M.S. Thesis, Indiana University, Bloomington.
- . 1950. Food animals used by the Indians at the Angel Site. *Proc. Indiana Acad. Sci.* 59: 19-24.
- . 1980. Faunal remains from tenant farmer sites, Waverly Plantation, Mississippi. In: W.H. Adams (Ed.), *Waverly Plantation: Ethnoarchaeology of a Tenant Farming Community*, pp. 437-451, Nat. Tech. Information Ser., Washington, D.C., App. 5.
- . 1981. Faunal remains. In: W.H. Adams, S. Smith, D.F. Barton, T.B. Rioran, and S. Poyer (Eds.), *Bay Springs Mill: Historical Archaeology of a Rural Mississippi Cotton Milling Community*, p. 477., Nat. Tech. Information Serv., Washington, D.C. App. 5.
- , S.J. Boling, W.H. Adams, and C. Rock. 1987. The James King Site of Cherry Point Plantation. In: William Hampton Adams (Ed.), *Historical Archaeology of Plantations of Kings Bay, Camden County, Georgia*, Invest. Dep. Anthropol., Univ. Florida, 5: 59-94.
- , W.H. Adams, S.J. Boling, and R.B. Adams. 1987. Harmony Hall Plantation. In: William Hampton Adams (Ed.), *Historical Archaeology of Plantations of Kings Bay, Camden County, Georgia*, Rep. Invest. Dep. Anthropol., Univ. Florida, 5: 101-129.
- , W.H. Adams, and J. Kearney-Williams. 1987. The Kings Bay plantation house and kitchen. In: W. H. Adams (Ed.), *Historical Archaeology of Plantations of Kings Bay, Camden County, Georgia*, Rep. Invest. Dep. Anthropol., Univ. Florida, 5: 131-163.
- , W.H. Adams, C. Rock, and J. Kearney-Williams. 1987. Foodways on the plantations at Kings Bay: Hunting, fishing, and raising food. In: W. H. Adams (Ed.), *Historical Archaeology of Plantations of Kings Bay, Camden County, Georgia*, Rep. Invest. Dep. Anthropol., Univ. Florida, 5: 225-275.
- Baker, F.C. 1923. The use of animal life by the mound-building Indians of Illinois. *Illinois State Acad. Sci.* 22: 41-64.
- Bockelman, H.J. 1936. A shell trumpet from Arizona. *Amer. Antiquity* 2(1): 27-31.

- _____. 1937. Two probable shell trumpets from Ontario. *Amer. Antiquity* 2(4): 295-296.
- Brown, C.L. and C.E. Gustafson. 1979. A key to postcranial skeletal remains of cattle/bison, elk, and horse. Washington State Univ. Lab. Anthropol. Rep. Invest. 57, 213 pp.
- Gilbert, B.M. 1980. Mammalian osteology. Laramie, 337 pp. (Privately published).
- _____, L.D. Martin, and H.G. Savage. 1981. Avian osteology. Laramie, 252 pp. (Privately published).
- Guilday, J.E. 1958. The prehistoric distribution of the opossum. *J. Mammal.* 39(1): 39-43.
- _____. 1963. Bone refuse from the Oakfield site, Genesee County, New York. *Pennsylvania Archaeol.* 33(12): 12-15.
- _____. 1969. Small mammal remains from the Wasden site (Owl Cave), Bonneville County, Idaho. *Tebiwa* 12(1): 47-57.
- _____. 1970. Animal remains from archaeological excavations at Fort Ligonier 1960-1965 by Jacob L. Grimm. *Carnegie Mus., Pittsburgh*, 42: 177-186.
- Hargrave, L. 1938. A plea for more careful preservation of all biological material from prehistoric sites. *Southwestern Lore* 4(3): 47-51.
- Lawrence, B. 1951. Post-cranial skeletal characters of deer, pronghorn, and sheep-goat with notes on *Bos* and *Bison*. Part II. *Papers Peabody Mus. Amer. Archaeol. Ethnol.* 35: 5-40.
- Loomis, F.B. and D.B. Young. 1912. On the shell heaps of Maine. *Amer. J. Sci.*, 4th Ser., 34: 17-42.
- Olson, S.J. 1960. Post-cranial skeletal characters of *Bison* and *Bos*. *Papers Peabody Mus. Archaeol. Ethnol.* 35(4): 1-64.
- _____. 1964. Mammal remains from archaeological sites - Part I, southwestern and southeastern United States. *Papers Peabody Mus. Archaeol. Ethnol.* 56(1): 1-162.
- Parmalee, P.W. 1959. Animal remains from the Modoc Rock Shelter site, Randolph County, Illinois. (Appendix II in Summary Report of Modoc Rock Shelter by M.L. Fowler). *Illinois State Mus. Rep. Invest.* 8: 61-64.
- _____. 1960. Vertebrate remains from Fort Loudoun, Tennessee. *Tennessee Archaeol. Misc. Paper* 6: 26-29.
- _____. 1965. The food economy of Archaic and Woodland peoples at the Tick Creek cave site, Missouri. *Missouri Archaeol.* 27(1): 1-34.
- _____. 1968. Cave and archaeological faunal deposits as indicators of post-Pleistocene animal populations and distribution in Illinois. In: *Symposium on the Quaternary of Illinois*, pp. 104-113, Univ. Illinois Press, Urbana.
- _____. 1973. Animal remains from Netherland Inn, Kingsport, Tennessee. In: J.L. Benthall (Ed.), *Archaeological Investigations of the Netherland Inn Complex*, pp. 81-86, National Park Service Grant No. 47-43-00023.
- Taylor, W.W. 1948. A study of archaeology. *Mem. Amer. Anthropol. Assoc.* 69, 262 pp.
- White, T.E. 1952. Observations on the butchering technique of some aboriginal peoples, No. 1. *Amer. Antiquity* 17(4): 337-338.
- _____. 1953. Observations on the butchering technique of some aboriginal peoples, No. 2. *Amer. Antiquity* 19(2): 160-164.

_____. 1954. Observations on the butchering technique of some aboriginal peoples, Nos. 3,4,5,6. *Amer. Antiquity* 19(3): 254-264.

_____. 1955. Observations on the butchering technique of some aboriginal peoples, No. 7,8,9. *Amer. Antiquity* 21(2): 170-178.

Wintemberg, W.J. 1919. Archaeology as an aid to zoology. *Can. Field Natur.* 33: 63-72.

Winters, H.D. 1969. The Riverton Culture: A second millenium occupation in the central Wabash Valley. *Illinois Archaeol. Surv. Monogr.* 1 and *Illinois State Mus. Rep. Invest.* 13, 164 pp.

ADDENDUM

Since the preceding paper was presented and submitted for publication some four years ago, many changes have taken place. The proposed move of the laboratory scheduled in 1990 could not be realized because of delays in planning and financing and later by a disastrous December fire in the Student Building during it's renovation.

The long-awaited move was made in early August, 1991 and will be described in detail in a future paper. A brief comparison of the old facilities and the new is given below:

OLD FACILITIES	PRESENT FACILITIES
1. 4th floor location	ground floor location
2. no elevator	elevator adjacent to lab
3. everything carried up stairs from and back down to parking lot	ground level unloading and access
4. restrooms on other floors	restrooms next to lab
5. minimal hot water availability	adequate hot water
6. no adequate control of heat/AC	climate-controlled air
7. small domestic chest freezers	large walk-in freezer
8. 2 fume hoods, unreliable exhaust	3 fume hoods & autopsy center
9. departmental office 4 floors away	office nearby
10. marginally adequate lighting	adequate lighting
11. extensive insect problems	adequate insect control
12. totally inadequate storage space	increased although still inadequate storage space
13. inadequate fire protection	appropriate fire protection
14. no accessibility for handicapped	handicapped accessibility
15. old wooden storage shelves and cabinets	metal shelving and cabinets though still inadequate
16. little computer capability	excellent computer hookups

The computerization of the 47 plus year old collections catalog is progressing well and should be available electronically to researchers country-wide by mid 1993.

