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**ZOOARCHAEOLOGY:
PAPERS TO HONOR
ELIZABETH S. WING**

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CONTENTS

<i>Enduring Foundations to a Holistic Science: Lessons in Environmental Archaeology from Elizabeth S. Wing</i> KITTY F. EMERY	3
<i>Zooarchaeology at FLMNH in the Context of the Growth and Development of This Discipline</i> ELIZABETH S. WING	11
<i>Deep Sand: Soil and Landscape Relationships at the Blueberry Site (8HG678), Highlands County, Florida</i> SYLVIA SCUDDER	17
<i>Screen Size and the Need for Reinterpretation: A Case Study from the Northwest Coast</i> KATHLYN M. STEWART and REBECCA J. WIGEN	27
<i>Middle Preclassic Landscapes and Aquatic Resource Use at Cuello, Belize</i> ARLENE FRADKIN and H. SORAYYA CARR	35
<i>A Preliminary Survey of the Birds from Velikent (Bronze Age, Daghestan, Russia)</i> ARTURO MORALES-MUÑIZ and YEKATERINA ANTIPINA	43
<i>Middle Bronze Age and Hellenistic Mollusk Meals from Soúrpi Bay (Thessaly, Greece)</i> WIETSKE PRUMMEL	55
<i>Resource Use through Time at Paloma, Peru</i> ELIZABETH J. REITZ	65
<i>Use of Fire in Shell Bead Manufacture at Cahokia</i> LAURA KOZUCH	81
<i>An Illustrated Guide to Trunk Vertebrae of Cottonmouth (Agkistrodon piscivorus) and Diamondback Rattlesnake (Crotalus adamanteus) in Florida</i> KAREN J. WALKER	91
<i>A Millennium of Migrations: Proto-historic Mobile Pastoralism in Hungary</i> LÁSZLÓ BARTOSIEWICZ	101
<i>Zooarchaeology of Cinnamon Bay, St. John, U.S. Virgin Islands: Pre-Columbian Overexploitation of Animal Resources</i> IRVY R. QUITMYER	131
<i>Animal Remains from Late Medieval Capabiaccio: A Preliminary Assessment of the Stock Economy</i> DIANA C. CRADER	159
<i>Horticultural Hunters: Seasonally Abundant Animal Resources and Gender Roles in Late Prehistoric Iroquoian Subsistence Strategies</i> ELIZABETH M. SCOTT	171
<i>Imagining Sixteenth- and Seventeenth-Century Native American and Hispanic Transformations of the Georgia Bight Landscapes</i> DONNA L. RUHL	183
<i>Soldiers' Diet at Valley Forge: An Analysis of the Faunal Remains from the 2000 Excavation Season</i> DOUGLAS V. CAMPANA and PAM J. CRABTREE	199
<i>A Bibliography of Literature by Elizabeth S. Wing</i> KITTY F. EMERY	205

ZOOARCHAEOLOGY: ITS GROWTH AND DEVELOPMENT AT FLMNH

Elizabeth S. Wing¹

While zooarchaeology is not yet a household word, our program goals demonstrate its relevance to a better understanding of the past and present. Zooarchaeologists examine the animal remains, often discarded refuse, excavated from archaeological sites. These remains reveal which animals were caught and used by humans in the past. Habitat preferences of the animals encountered in the refuse provide insight into the past economy at the site. The effects of human hunting and fishing does not stop with the meal that the catch provided, it also impacts the subsistence enterprise on the animal populations. Similarly, land clearing and plant cultivation can enhance habitats for those animals that might prefer ecotonal zones and consume crops. Land clearing might also promote erosion, producing turbid water and less favorable conditions for those animals that require clear waters. While the complex of animals in archaeological contexts reveals much about past lifeways, the effects of past human exploitation leave their marks on the modern landscape and contemporary animal populations.

Even though some sites, such as the big shell mounds in the southeast U.S. and other parts of the world, are composed overwhelmingly of animal remains, zooarchaeology got a slow start as a sub-field of archaeology. The molluscan remains that compose the mountains of shells that make up some sites often did not attract much interest for anything other than a source of paving material. The earliest studies of animal remains that focused on documenting the source and the history of animal domestication were centered in the Near East (southwest Asia). Europeans with training in veterinary medicine or zoology undertook much of this research. The animals of concern were sheep, goats, cattle, pigs, and horses and how their domestication not only changed those species from which they are derived but also transformed the cultures that domesticated and herded them. Some outstanding studies of the animal remains left by people who were hunters and gatherers in North America were conducted during the late 1800s and early 1900s. By the middle of the twentieth century, zooarchaeology took on a more quantitative and interpretive character.

The proceedings of a conference entitled *The Identification of Non-Artifactual Archaeological Materials*, edited by Walter W. Taylor and published by the National Academy of Science in 1957, discussed the "identification problem." The situation that instigated the conference was that archaeologists would bring bags of bones to zoologists to identify in hopes of learning about the past uses of animals. Many of the zoologists pressed into service had projects of their own and did little more than provide the archaeologist with a list of taxa present. The recommendations of the members of the conference were to encourage specialization in zooarchaeology by people able to accurately identify fragmentary remains and who were also well informed about the nature of the archaeological deposits. Archaeologists clearly needed specialists with an interdisciplinary approach to transform animal remains into a scientific endeavor. The establishment of the International Congress of Archaeozoology (ICAZ) promoted these ideas. ICAZ as a professional organization flourishes to this day.

ZOOARCHAEOLOGY AT THE FLORIDA MUSEUM OF NATURAL HISTORY

Zooarchaeology was initiated at the Florida Museum of Natural History (FLMNH; formerly known as the Florida State Museum) in this intellectual climate. The very efforts to use zooarchaeological materials began in a fortuitous way. Faunal remains excavated in Trinidad by Irving Rouse of Yale University and John Goggin of the University of Florida were given for identification to Pierce Brodkorb in the Zoology Department at the University of Florida. A student of Dr. Brodkorb began work on these collections, then for personal reasons left both the university and the bags of bones. These materials happened to fit into my dissertation proposal to understand changes in the mammal fauna of Trinidad as it broke from the mainland and became an island. I was given permission to take over the study of these materials, then incorporate the results into my dissertation. This study led to a Ph.D. (1962) and permission to continue the pursuit of zooarchaeological research made possible by funding from the National Science Foundation.

From these beginnings, a program in zooarchaeology grew with the support of the FLMNH and the National Science Foundation (NSF). The program developed both

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according to design and serendipitously, taking advantage of research opportunities. Basic questions needed to be explored, including subsistence economies in the past, environmental change through time, human impact on island ecosystems, uses of animals by people who cultivated domestic plants, and New World animal domestication. Before any of these topics could be addressed, an adequate comparative collection had to be assembled. Growth of the comparative collection continues to this day, but in the beginning the aim was to get one specimen of each species that might have been used by humans in the southeast and Caribbean. The next step was to expand the range of sizes and to include specimens of both males and females. The early shoestring curation of these specimens was in baby food jars because they were a useful size and were very plentiful. The Wing and colleagues' families had young children during the germination and early growth of the zooarchaeology program. We would often buy baby food as much for the type of jar the food came in as for the food itself. Food in jars with screw-on lids sustained Molly (born 1961) and Stephen Wing (born 1965). Preparing specimens and taking field trips were parts of their early experiences.

THE SOUTHEAST AND CARIBBEAN PHASE OF RESEARCH

The southeast U.S. and the Caribbean were logical areas in which to begin zooarchaeological studies. Many samples from sites had been recovered and were available for study. They were not necessarily recovered in a systematic way and, if the material was sieved, it would have been through coarse-gauge screen (1/4- to 1/2-inch). This early exploratory work formed the foundation of a database of identified faunal samples assembled in this opportunistic way. The results formed the basis for more focused research addressing questions of seasonal occupations of sites, fishing technology, trade in animal resources, contribution of mollusks to the prehistoric diet, and change in animal use through time.

The initial exploratory work was made possible by two successive NSF grants. The first project from 1961 to 1965 was entitled "Approaches to the analysis of post-Pleistocene environments in the southeast and Caribbean based upon study of vertebrate remains from archaeological sites." Co-investigators were Clayton E. Ray, John M. Goggin, and William H. Sears, with E.A. Wing as an associate investigator. A part of this work included collecting modern comparative fish specimens in the West Indies (1964) with the help of Carter Gilbert and John Randall. This paved the way for future zooarchaeological work in the Caribbean. The second

project from 1966 to 1968 was entitled "Basic economic patterns of prehistoric fishing communities of the Gulf of Mexico and the Caribbean." In the time between these two NSF grants, I had a contract for zooarchaeological work in Jamaica under an NSF grant awarded to R.R. Howard. During the course of this research, and particularly after the studies in Jamaica, it became possible to ask more focused and interesting questions. It also became clear that methods of recovery, identification, and analysis had to be improved before more progress could be made in this field of endeavor.

RESEARCH IN MEXICO AND OTHER PARTS OF MIDDLE AMERICA

The first opportunities to work on faunal remains from inland Mexico came in 1968 with a year-long contract under an NSF grant awarded to Michael D. Coe for research at the Olmec site of Tenochtitlan in Vera Cruz. With the help of Robert R. Miller, it was possible to collect freshwater fishes, including many confusingly similar species of cichlids. This was followed in the period of 1972 to 1975 by research in Vera Cruz with Jeffery Wilkerson, the Marismas Nacionales of Sinaloa and Nayarit with Stuart Scott, and Panama with Olga Linares. Earlier studies in Yucatan were done under the auspices of E. Wyllys Andrews. Together these projects allowed study of the animals associated with people who had a fully developed agricultural system but no domesticated animals other than the dog and turkey.

The Wing children were old enough and self-sufficient enough to take on some of the field work in Mexico. The most memorable trip was to the Marismas Nacionales in 1972. Rochelle Marrinan joined the two children and me to explore this large estuarine area and study the faunal remains excavated from nine sites. We lived in a small shark-fishing community. Steve took in all the activity with relish, singing, "This is the happiest day of my life," as he checked the catch of the day and acted as midwife to the dead mother of 35 unborn tiger sharks. He was allowed to keep the tiger shark jaws, which we took back to the museum, along with other specimens we had prepared. While our luggage with these treasures was deemed too undesirable to allow us to register in the hotel in Mexico City, at least we did not have the stuffed toad playing a mandolin that Rochelle and Steve thought I should buy for him.

RESEARCH IN PERU WITH A FOCUS ON THE DOMESTICATION OF ANIMALS

Archaeological sites in the Andean highlands hold evidence for domestication of most New World animals. Study of the processes of domestication could be modeled

after the research done at other centers of animal domestication, such as the Near East, keeping in mind the many differences between these areas. The opportunity to work on the animal remains excavated by the University of Tokyo Andean Expedition became available. Once again NSF made this possible with a grant from 1968 to 1969 entitled "Utilization of animal resources of the Kotosh site, Peruvian highlands." One component of this grant was to bring a member of the Tokyo team to the FLMNH to translate the labels and help with identification so that upon return to Japan he could be their faunal analyst. As it turned out, he was a gifted artist and illustrated our report.

Even though human occupation of Kotosh was of long duration, that single site could not yield answers to all the questions regarding animal domestication. To further pursue this inquiry, a second project, entitled "Prehistoric man-animal relationships in the Central Peruvian Andes," was funded by NSF from 1970 to 1973. In addition, I had the opportunity to work in Ayacucho on contract under a NSF grant awarded to Richard S. MacNeish. This interdisciplinary research was coordinated with Kent Flannery, who worked on the faunal samples from the high-elevation Puna altiplano, while I worked on the samples excavated from the valley. Seven years later, in 1980, Elizabeth Reitz and I, with the help of two Peruvian zooarchaeologists, Carman Rosa Cardoso and Denise Pozzi-Escot, worked on faunal remains excavated by Craig Morris at the Incan urban center of Huanuco Pampa. Molly Wing came along to Huanuco and illustrated the worked bone from the Huanuco Pampa site. (Molly, a tall, slender, blue-eyed blonde, did not go unnoticed in the town square of Huanuco, where the opportunities to practice Spanish and scientific illustration were good.) Even today, there is still much to do to fully understand the source of animals that could be domesticated, the process by which they were, and the spread of domestic animals and animal husbandry knowledge.

RETURN TO RESEARCH IN THE WEST INDIES

Based on improvements in the methods of recovery, our expanded comparative collection, and the complementary studies of plant remains, we initiated a new project funded by NSF from 1989 to 1992 entitled "Subsistence in prehistoric West Indian economies." Using fine-gauge screens, this allowed identification of many newly recovered samples, with the plant remains being identified by Lee Newsom. The use of fine-gauge screen was critical for analyses of overexploitation because one of the lines of evidence for overexploitation was the decline in the size of organisms. When only coarse-gauge

screens are used to recover faunal samples, the size range is biased because the small end of the size range is missing. Improved recovery strategies allow investigation of size declines, changes in species composition, and corresponding changes in plant remains. This research on both plant and animal remains is being integrated from the perspectives of human adaptation and island biogeography. Lee Newsom and I have prepared a manuscript on this research that will be published by the University of Alabama Press.

GROWTH AND CARE OF THE ZOOARCHAEOLOGY COLLECTION

One part of the research program outlined briefly above was the collection of comparative specimens and zooarchaeological samples. Often the zooarchaeological samples were on loan to the FLMNH for identification and analysis, ultimately to be returned to the archaeologist working on the site or to the country from which the material was recovered. In other cases the archaeologist excavating the site chose to deposit the faunal material at the museum for curation and long-term care. The comparative specimens were always collected in full accordance with local and federal regulations governing the capture of animals. By the year 2000, the zooarchaeology collection included 8,700 comparative specimens and 600 zooarchaeological samples.

The curation of the zooarchaeological and comparative collections involves preparation, cataloging, and organization, requiring the full-time work of several people. A full-time faculty position, that of assistant curator, was offered to me in 1979, which I accepted with enthusiasm. A part of the NSF Kotosh project supported the research and curation work that had been done by Takeshi Ueno from 1968 to 1971. A number of other people, including Kent Ainslie, David Dorman, Lynn Cunningham, and Sandra Courter, contributed in substantial ways to the curation of this growing collection and were supported either by museum or grant funds.

Real continuity and growth came when Sylvia Scudder began work in the zooarchaeology collection in 1980. Sylvia started work at the museum in 1972 when collections were moved from the Seagle Building to the new museum building now called Dickinson Hall. She worked in the herpetology collection and then the mammal collection before she began work in zooarchaeology. At present, she is the collection manager of our multi-faceted collection. In this capacity, she has organized work in the collection and has hired work-study students to help maintain it. In addition to her work as a collection manager, Sylvia has done basic research in zooarchaeology, identifying and analyzing faunal

remains from Florida, Jamaica, Middle Caicos, Belize, and Yucatan. She has used the comparative collection to analyze the vertebrate remains from bald eagle nests, alligator stomach contents, and other samples brought to the museum by wildlife biologists. Since completing her Master's degree in soil science, she has become one of the few authorities on anthropogenic soils and has studied the soils from many sites in the southeast and Caribbean to shed light on the soil development of archaeological deposits.

The National Science Foundation supported three initiatives to improve curation of the zooarchaeology collection. The first, for 1979-1980, was funding to prepare a photographic atlas of the nine most diagnostic skull elements of each fish species in the comparative collection. The rationale was that identification could start with a review of the photographic atlas before specimens were examined, thereby reducing wear and tear on the specimens. Bonnie McEwan selected the specimens and Donna Borne Drake photographed approximately 9,000 elements. The second grant, for 1984-1985, was to install compact storage units for the zooarchaeological collection. The units save space by eliminating all but one aisle that is created by moving whole rows of cabinets on rails. The third curation grant, 1995-1998, was to computerize collection data. The museum as a whole had begun computerization using the SELGEM system, but with the incredible growth of computer capabilities we transferred the old SELGEM files to a relational data base called PARADOX, then once again to ACCESS, in order to conform with other museum collections.

During the development and growth of the zooarchaeology program, computing systems became transformed. Our first "calculator" was a Monroe adding machine that would also subtract and was about the size of an unabridged dictionary. When they first came out, I bought a Texas Instrument hand calculator at enormous expense, but with it we were able to get rid of the Monroe monster. Data entry into the SELGEM system required using a machine that recorded information on punched tape. It did this so loudly it required the data entry person to wear ear protectors the size of large earmuffs. In 1985, we were able to buy an Apple computer through a gift from Bobby Dorion. We continued to use Apples for a number of years until communications between computers and a uniform system throughout the museum was recommended, at which time we switched to a Microsoft Word/PC system. With these advances and the addition of photocopying machine, scanner, laser printer, and fax machines, we have become quite self-sufficient.

One of the next steps we plan is to wed the photographic atlas with the web page and make the photographs available on the Internet. The comparative collection data are already on the web page. With the addition of photographs, these data will become even more useful for research initiated within and outside of the museum.

TEACHING

An upper-division and graduate-level class in zooarchaeology has been taught on a regular basis since 1970. Recent instructors have been Karen Walker and, at present, Susan deFrance. Over the years, students wanting more advanced studies in zooarchaeology do independent studies or become involved in some funded research project.

Graduate students have participated in projects in the collection and some engaged in masters and doctoral research in zooarchaeology. During the course of their work, they have become important contributors to the program and have enhanced the level of inquiry. Those students who have engaged in masters or doctoral research include Kathlene Byrd, Stephen Cúmbaa, Arlene Fradkin, Susan deFrance, Stephen Hale, Laura Kozuch, Rochelle Marrinan, Bonnie McEwan, Elizabeth Reitz, Elizabeth Scott, and Karen Walker. Some graduate students from other institutions have also used the zooarchaeology collection for their research. These students include Helene van der Klift and Mark Nokkert (University of Leiden), Sandrine Grouard and Nathalie Serrand (National Museum in Paris), Nancy Hamlin (University of Arizona), Erin Henry (Beloit), Julian Kerbis (University of Chicago), David Morgan (Tulane), and Susan Scott (University of Michigan).

The graduate students bring a vitality and excitement of discovery to the research and activities in the laboratory. New points of view and questions discussed are refreshing for everyone. Groups of students organized events around some projects in the laboratory. These evolved into social gatherings that brought cohesion to the group and things to remember and laugh about years afterwards. For example, the students initiated a crab feast when we needed data on the ratio of weight of meat to shell for blue crabs. Wild-meat sampling and bone-saving parties, with armadillo as the *pièce de résistance*, became the featured meat at the annual Armadillo Roast still put on over thirty years later by graduate students in the Anthropology Department in honor of Dr. Charles Fairbanks. When the freezer got too full, the Friday afternoon specimen-preparation parties got the job done and became a social event. On the more frivolous side, one Easter the students put on a

Mad Hatter competition for the most original or extraordinary hats, which, after construction, were taken on parade. Such gatherings did not detract from the research mission or the sense of responsibility for the best possible care of the collections, rather they put a human face on the work and engendered cooperation and mutual support.

Thus far, several books intended to guide students in zooarchaeology have been written. The first, entitled *Paleonutrition*, by Antoinette Brown and me, was published by Academic Press in 1979. I supplied the zooarchaeology background and Brown the physical anthropology evidence for studies in assessing human nutrition in the past. This book was followed twenty years later by a book entitled *Zooarchaeology*, written by Elizabeth Reitz and me and published by Cambridge University Press in 1999. This later book attempts to update all the methodological and theoretical advances made in the field of zooarchaeology to that point. Its extensive bibliography helps students explore the field beyond the topics discussed in the book. Though the book has worldwide coverage, its focus is on work in coastal or riverine zones. Examples presented in the book include invertebrates and all classes of vertebrates. The perspective is holistic, integrating data from remains of plants and animals, soils structure and chemistry, and human changes to the landscape.

A third book, *Case Studies in Environmental Archaeology*, is a collection of papers edited by Elizabeth Reitz, Lee Newsom, and Sylvia Scudder and published by Plenum in 1996. It includes papers on a whole array of topics that relate to past environments. This book integrates data from different types of archaeological materials to gain a better understanding of past human conditions and the impact of human activity on the landscape and on other animal populations.

ENVIRONMENTAL ARCHAEOLOGY, 1990 TO 2001

With this holistic perspective in mind, we re-named the collection "Environmental Archaeology" to better reflect the advances made in understanding the past, of which zooarchaeology is a part. The new name better expresses what the collection has become and recognizes the multifaceted nature of the research approach.

Zooarchaeology continues to be one of the main features of the collection. Initially the focus of research was on vertebrates. However, while invertebrates, primarily mollusks, may be the material that produced huge prehistoric mounds, the mollusks themselves often were not studied. That did not make sense because much can be learned from detailed studies of both mollusks

and vertebrates. One example is the work done by Irv Quitmyer, who began work in zooarchaeology on a big project at Kings Bay on the southeast coast of Georgia. As a part of that project, he used fine-gauge screens to recover vertebrate and invertebrate remains. After analysis, he published the results of this major endeavor in 1985. The technique continues to be a model for research today. In addition to the research that was done on that project, Irv has sectioned molluscan shells along their growth axes and used isotope analysis to study changes throughout the lives of organisms. This has produced new information about seasonal occupation of sites and past temperature regimes. Irv continues to conduct research in the southeast and Caribbean, integrating data from the entire range of animals that are preserved and recovered.

Susan deFrance, assistant professor of anthropology at the University of Florida, and Elizabeth Reitz, professor and former director of the Museum of Natural History at the University of Georgia, each have courtesy appointments in the FLMNH and conduct research in the collections as their schedules permit. Both Susan and Betsy work on faunal material from historic and prehistoric sites in the southeast U.S. and Caribbean and Andean countries.

Archaeobotany, the botanical equivalent of zooarchaeology, is an important component of environmental archaeology, as well as any research that attempts to understand past economies and environmental change. Lee Newsom undertook the first work in archaeobotany within the zooarchaeology collection. Her research, a study of the plant remains from the Hontoon site in Florida, became the subject of her Master's degree. This was followed by research on plant remains from a series of West Indian sites that became the topic of her Ph.D. dissertation. This work coordinated with research on animal remains, now being prepared for publication. After graduation, Lee went to Southern Illinois University and is now at Pennsylvania State University. Donna Ruhl, a University of Florida graduate student in anthropology, is continuing work in archaeobotany. She has worked on plant remains from both historic and prehistoric sites in the southeast. She is also maintaining and adding to the archaeobotanical and comparative plant collections begun by Lee.

Donna Ruhl and Karen Walker have joined forces on a long-term research project to examine plant and animal remains excavated from sites in the Everglades. They are being helped by Lesley Martin and Tanya Peres. Much of their research adds new information about how people lived in this unique habitat in the southern-most part of the state. They are also integrating their finds

and examining environmental changes spanning the time that people have lived in that area. This important research exemplifies the integrative approach of the Environmental Archaeology unit.

Another important component of this unit is the study of anthropogenic soils. Sylvia Scudder, who manages the zooarchaeology collection and oversees work in the unit, completed a Master's degree in soil science in 1993. Her thesis was a study of the soils at the Horrs Island site in southwest Florida. This work complemented that of Irv Quitmyer, who studied the animal remains excavated from this site. Sylvia has since studied soils from many sites in the southeast and Caribbean and been able to document the soil development and landscape changes resulting from both natural and human forces. This work was often done in concert with studies of plant and animal

remains, such as the projects at Lake Monroe, Archaic Shell Rings, and Mosquito Lagoon.

The vitality of the Environmental Archaeology unit owes much to the hard work of the many people dedicated to the highest standards of research and collection care. These include people on the museum payroll, those supported by grants and contracts, and those who graciously volunteer their help. This research and curation would not be possible without the support of the FLMNH and the many archaeologists who have entrusted and continue to entrust to us the soils and the plant and animal remains they have excavated for care, preservation, and study. A special thanks is due to the National Science Foundation for their funding over the years that has made the establishment and growth of this endeavor possible.