

The Importance of Zooarchaeological Studies in Sri Lankan Archaeology: An Anthropological Perspective

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Abstract—It is still debated in archaeological discourse as to when and where the interaction between humans and animals began. From the time they ate their flesh, to the present, the use of animals for human use can be observed. The primary purpose of Zooarchaeology is to determine the interrelationships between humans and animals through animal bones unearthed from systematic archaeological excavations. Zooarchaeological researches have proved the potentiality of reconstructing or determining the dynamic interrelationships within humans and animals, whether as their prey or domesticated hand for natural and social spaces. Importance of animal bones was recognized by as early as the 1700s, as a discipline of archaeology, it grew the attention focused on the bones preserved within the archaeological sites. Zooarchaeological analysis has addressed questions ranging from human behavioral ecology to the processes of domestication to how animals located in the social realm. Such information causes us to better comprehend the means systems of ancient humanity and their suggestions for such factors as site use, versatility, and life history. The anthropological view of Zooarchaeology has determined to study the way of Interactions between animals and humans in homological perspective; therefore, we can understand the human choice, hunting tactics, and cognitive vision through faunal remains. Sri Lankan zooarchaeological studies dated back to 1930s, when P.E.P. Deraniyagala began the studies of the fossil records of the life phases of Ceylon. Till present, this field has been fostered by a considerable number of scholars. They are actively working on popularizing this subject in the field of archeology in Sri Lanka. An Anthropological perspective would clarify Forager ecology, reconstructing human demography, domestication (morphological and genetic), and animals in human society rather than methodological and biological questions. The study presented here is based on the zooarchaeological remains recovered from the recent excavation campaigns and focuses on the anthropological perspective of faunal analysis.

Keywords—Cultural Ecology, Human Behavioral Ecology, Palaeodemography, Zooarchaeology.

I. INTRODUCTION

As the discipline of archaeology grew in the following centuries, the attention focused on the bones preserved within the archaeological sites also increased. This “ecological perspective” has brought by Binford; an American archaeologist knew for his influential work in “Processual Archaeology”. He has argued that the culture-historical approach of Archaeology reflected the same ‘stamp collecting’ mentality and archeology should move away from art history and antiquarianism (Binford, 1968). Therefore, Zooarchaeology has become evident as a method of reflecting

human behavior through physical remains of the past.

Food as material culture is increasingly acknowledging as a significant area of research within both environmental archaeology and material culture studies. Anthropologists recognized the importance of food as part of cultural and social developments and, in the last five to ten years, archaeologists have become increasingly aware of the importance of looking at both consumption patterns, and at food as a vital aspect of material culture, rather than the more traditional production regimes of environmental archaeology.

Sri Lankan zooarchaeological studies date back to the 1930s, in the time of Dr. P.E.P. Deraniyagala’s tenure of Sri Lankan Archaeology. He was a man with a keen enthusiasm for natural sciences. He initiated fossil records of the life phases of Ceylon (Deraniyagala, 1960 b; Deraniyagala, 1955 b; Deraniyagala, 1935; Deraniyagala, 1946). Deraniyagala (1946) describes the ‘Ratnapura Fauna’ is represented by three species of elephant, two species of rhinoceros and a species each of hippopotamus, lion, tiger, gaur, wild dog, wild boar, black turtle, and soft-shelled terrapin to name a few of the extinct animals of Sri Lanka. The Ratnapura Phase was characterized by wet and cool climatic conditions. According to Deraniyagala, (1958) the Pleistocene climate consisted of three distinct phases termed Ratnapura Phase, PalagahaThurai Phase, and Colombo Phase (Early Holocene). This is the first recorded ancient climatic reconstruction of Sri Lanka built with animal remains. P.B. Karunaratne assisted Deraniyagala in his fields of researches in paleontology and Zooarchaeology. He served as the zooarchaeologist to the Department of Archeology’s survey of prehistoric and historic sites. He identifies faunal remains in many prehistoric cave sites including Beli Lena – Kithulgala, Batadombalena – Kuruwita, and Alulena at Attanagoda (Manamendra-Arachchi, 2012). The era of Dr. Siran Deraniyagala is remarkable in initiating an ‘ecological perspective’ on Sri Lankan prehistoric archeological studies (Deraniyagala, 1992). Excavations undergone with his presence in the inner city of Anuradhapura have focused on animal selection and animal domestication in the protohistoric period (Deraniyagala, 1972). As a post-generation Prof. Gamini Adikari, Kelum Manamendra-Arachchi, Dr. R.M.M. Chandrarathne, and Jude Perera are carrying out their responsibilities and transmitting zooarchaeological discipline to future generations.

II. THEORETICAL BASIS

The philosophical evolution of Western thought has been able to change the course of many disciplines. Evolutionary structuralism and postmodernism, it is here that the major driving forces play a major role. The impact of these concepts on archeology has also been transmitted by various theoretical approaches, as evidenced by the development of a concept called “New Archeology” in the early 1960s. The influence of the above concepts is reinforced by the emergence of a “Post-processual Archaeology” in the West since the 1970s, inspired by postmodernism. All of these theoretical concepts have had a profound impact on the orientation and role of ancient cultural ecology in archeology. Julian Steward is known as the father of cultural ecology and this theory is most clearly explained in his “Theory of Cultural Change: Methodology of Multilinear Evolution” (Steward, 1955). Evolutionary approaches such as V. Gordon Childe and Leslie White's commentary on the nature of human relations, in particular, have led to the emergence of cultural ecology (Park, 1936).

To understand ancient cultural ecology, one must first understand the nature of the mutual relationship between man and the environment. Over the past four or five million years, humans have established themselves in a variety of ecological zones on the surface of the earth and have progressed gradually. Compared to other animals, humans can be described as a victorious part of their survival and development in a biological and adaptive mechanism. Human activities are capable of causing widespread changes in the environment, that human activities in the present environment are enormous and have become critical to the survival of life. The imbalanced distribution of various ecological zones in each phase of humanity, which has a history of several million, is different from the impact that human beings have on their biological features and technological tools. For this too must understand that they live in the ecological zones of the geophysical conditions of natural resources and energy that have been affected as a constant to determine the form of the dynamic nature of human activities (Sutton & Anderson, 2010).

In the study of cultural ecology, it is clear that human beings and their cultures are inextricably linked to the environment in which they live. These two components are interrelated and interdependent. Man is a technical and very social creature with independent mutual bonds. All these characteristics make man different from other animals. Therefore, the interactions between him and the environment are more complex and innovative. To study cultural ecology, it is important to have an understanding of human ecology. If ecology is the study of interactions between organisms and the environment, then human ecology can be interpreted as the study of the interactions between people and their biological cultural and physical environment.

In the study of cultural ecology, it is important to understand the nature of the interactions people have with their

environment and to substitute that knowledge for study. All theoretical and attitudinal approaches should be used to help people understand and adapt to their unique strategies. First of all, from the evolutionary ecological perspective, the way humans act on the environment has been studied. In the second approach, man is described as a rational and thoughtful selector. In this case, man is studied as having different goals. He uses a variety of rational methods and techniques to achieve those goals. Man always looks for the best in the physical space in which he lives. But since the environment is not well-informed, he focuses on alternatives for his survival. For example, socio-cultural and cognitive factors may have influenced human decision-making in ancient human societies, or perhaps even more ecologically. Paleo-human decisions can be analyzed in terms of the use and management of the environment and the way resources are managed. Evolution and Adaption help through a better understanding of Ancient Cultural Ecology.

Change and adaptation are fundamental elements of human ecology.

All environments are dynamic and subject to change in time and space. When an environment changes, the living organisms are also adapted to withstand that environmental change. This process is a mechanism and man is different from other organisms because he uses a biologically and culturally adaptive mechanism. One of the core concepts of cultural ecology is to understand that culture is a mechanism. According to evolution, the shape of organisms is determined by natural selection and biological evolution (Darwin, 1859). Lifestyle and subsistence are important in the theme of culture. The majority of ecological studies are based on subsistence patterns. In addition to food in subsistence patterns, resource technology, social and political organization encompasses all other methods of living and living. How each of these human groups operates at different levels is shaped by their culture (Butzer, 1975).

Cognitive Archeology and The Law of Internal Dynamics are two major theoretical concepts that contribute to the study of ancient cultural ecology. In Western countries, the concept of the internal gears has been widely used for archaeological studies. New-archaeologists and post-processual archaeologists have emphasized that in reconstructing the antiquity of man, he must study the whole state of affairs rather than isolation (Binford, 1968). Inspired by theories of post-processual archeology, this concept emphasizes the intangible aspects of ancient cultures. This concept helps to identify how the minds of ancient human beings worked, especially concerning ancient environments. In defining what cognitive archeology is, it is simply a matter of interpreting the extent to which the minds of human beings of ancient cultures functioned and the nature of their action through material remains (Flannery & Marcus, 1996). To this end, their archaeological cultures can be interpreted by archaeological remains left behind by rituals, traditions, etc. In Cultural Ecology, the utility of cognitive archaeology is to

define the way they choose their physical space for their lifestyles, technological tools, settlements, and any kind of activity on the ground.

The law on internal dynamics is also important in cultural ecology studies. Internal dynamics is the changing nature of the internal. Prof. Senaka Bandaranayake first emphasized the importance of internal dynamics in the archaeological development of Sri Lanka, though this theory is widely used in the West for archaeological and historical studies. He points out that the history of the country is shaped by its style and is based on the internal dynamics of the country.

All the characteristics and developments of a particular culture are the result of the internal dynamics of the conflict between man and the environment as well as man and man. External factors refer to other ecological regions and cultures. Relationships with those external factors are very important to the culture, but their importance depends on the degree to which the internal needs are satisfied. Therefore, those external factors are always second to the law of internal dynamics. This concept is very similar to the concept of individualism presented by post-processual archaeologists. This means that objects belonging to the same set have different characteristics. In ancient cultural ecology, these theoretical concepts are important because the impacts of each of these cultures on different cultures differ, as well as the impact that cultures have on those ecosystems.

Focusing on Zooarcheology following an ancient ecological-anthropological approach, it can be used to answer many stretching questions in the modern archeological paradigm.

III. FORAGER ECOLOGY

Foraging refers to searching for wild resources. It's beneficial from animals or a person's fitness which is an important role in the ability to survive or reproduce. Behavioral ecology is a young and explicitly Darwinian approach to the study of behavior (Hames, 2011). It emphasizes the adaptive value of behavior patterns of individuals as they attempt to solve social and environmental problems that affect their chance of survival and reproduction. Faunal assemblages, even those from archaeological sites, are the result of complex amalgamations of many events, only some of which involve the human agency. Isolating those animals that were deposited by human dietary behavior is thus a critical, but by no means straightforward, task (Egeland, 2018). Because subsistence is fundamental until recently zooarchaeological analysis of hunting and gathering has relied most heavily on Foraging Theory, which posits that people will try to acquire the most energy while expending the least. Human behavioral ecology has been used to analyze hunter-gatherer economics with favorable results for over two decades. It begins with an optimization that refers to behavior that will tend towards constrained optimization (Winterhalder & Kennett, 2006). Within Zooarchaeology, the incorporation of models from human behavioral ecology has contributed a much better understanding of why humans make the subsistence decisions

that they do (prey choice, dietary diversity and patch choice) and how these choices interact with environmental context and human demography (Diehl & Waters, 2006; Steele, 2015).

It's worthwhile to take a look at frequencies of identified faunal remains unearthed from the Gedige Excavation¹, Anuradhapura (Young & Coningham, 2010; Chandraratne, 2015). Using prey indices of identified specimens at the Gedige excavation, it's possible to illustrate the decline of the highest-ranking prey; which provides the highest caloric return through time. Concerning the frequencies of identified specimens at the excavation, the majority belongs to freshwater bivalves (*Lamellidens* sp), which represents 15.07% (n=735) of total bone assemblage, followed by *Rattus* sp (n=705, 14.45%), *Lissemys punctata* (n=634, 13.0%), *Melanochelystrijugathermalis* (n= 513, 10.52%), generally known as rodents, soft terrapin, and hard terrapin respectively (Chandraratne, 2015). Ground dwelling mammals are much rare, representing mainly by *Axis axis Ceylonensis* (n= 434) which is 8.90%, *Sus scrofa cristatus* (n=408, 8.37%), *Bos indicus* (n=271, 5.56%). Large herbivores (ex-*Elephas maximus maximus*, *Bubalus bubalis bubalis*, *Equus caballus*) and medium-bodied hoofed animals (ex-*Capra hircus*, *Cervus unicolor*) is representing less than 1% of total bone assemblage. Non mammalian vertebrate remains mainly comprised by *Varanus bengalensis* and freshwater fish species, which is less than 4% combined. Same situations occur with birds significantly *Gallus lafayeti* by 3.01% (n=147) and *pavocristatus* by 0.45% (n=22) (Chandraratne, 2015). It's obvious to identify reflect resource depression, where human activities; regular hunting of high-ranked animals created declination of foraging efficiency because the higher ranked prey declined in abundance and therefore lower-ranked prey (*Lepus nigricollis singhala*, *Lissemys punctata*, *Melanochelystrijugathermalis*² representing 3.88%, 13.00% and 10.52% of total bone assemblage respectively) were taken more often (Chandraratne, 2015). The proportion of these low ranked preys³ are relatively high in comparison to high ranked preys.

When considering lowland wet zone prehistoric cultural layers, the bones of monkeys constitute the majority of the mammalian sample, followed by squirrels, civets, and mongooses (Perera, et al., 2011; Perera, 2010). Monkeys, which account for a large portion of the animal biomass in tropical forests, have lower caloric return rates than do many smaller terrestrial animals and plants (Piperno, 2006). When questioning why they hunted monkeys, another interesting hiatus occurs. *Semnopithecus vetulus* (Purple-faced Langur) and *Macaca sinica* (Toque Macaque) represent about 20-25%

¹The Gedige excavation has been directed by Dr. S.U. Deraniyagala (AG85) in 1984 and Coningham (ASW2) in 1989-1991

²Littoral mollusks and tortoises the most easily caught small prey species, are also the most sensitive to hunting pressure from humans

³Usually resources such as hares, birds, tortoises, and mollusks that do not provide a high caloric return because they are small and energetically expensive to capture or process

of the largest portion of fauna excavated and discovered in prehistoric cave habitats in the wet zone rainforests (Perera, 2010; Perera, et al., 2011). Its contrast that the prehistoric man who lived in the wet zones of the rainforest has hunted the Purple-faced langur and Toque Macaque in the upper canopy of the forest (Dela, 2007; Dittus, 1974; Dittus, 1975), although it is extremely difficult to hunt. In general, the proportion of total wet zone caves is about 80% higher than that of Purple-faced Langurs, and the remainder represents Toque Macaques. Thus it is clear that the prehistoric man of Sri Lanka has hunted Purple-faced langur more toque monkeys (Medagedara, et al., 2015). Due to the small amount of flesh in the body of the Toque, the prehistoric man may have hunted purple-faced langurs that were heavier and larger in relative. It is logically impossible for a man who hunts small animals (reflected from Batadombalena, Fahien Lena, Alavala Lena, Beli Lena faunal remains) to ignore Toque monkey that weighs a few kilograms. It's under further clarification of why the people hard hunted purple-faced langur while the toque macaques that could easily be hunted.

IV. RECONSTRUCTING HUMAN DEMOGRAPHY

Archaeologists have long concerned about the crisis of reconstructing changes in ancient human population sizes and densities from the materials unearthed from systematical archaeological excavations. Prehistoric human relied on both small animals and ungulates for meat, but the relationship between humans and animals are more sensitive indicators of changes in human population density (Stiner, et al., 199). Small animals were important to the human diet throughout ancient times. Most common in the Gedige excavation midden are the remains of tortoises, shells, and hares (Chandraratne, 2015). Other small-bodied species were also consumed on occasions (See Chandraratne, 2015). Particularly, mollusks have the potential to be quite informative, it's possible to account for environmental variation. Increasing human population densities is seen as the most likely explanation for the declining mollusks sizes in a number of case studies, with the interpretation being most convincing when influences of environmental factors on growth rates can be discounted as the explanation (Steele, 2015).

A distinctive feature of Batadomba-Lena is that small to medium-bodied (<20 kg) agile prey species (monkeys, squirrels) formed the cornerstone of its occupants' diets from the outset, and played a significant role in technologies of food procurement throughout the occupation of the site. Larger-bodied, ground-living prey animals appear to have made only a minor contribution to the diet of Batadomba-Lena inhabitants.

V. DOMESTICATION: HUMANS AS PREDATORS

Domestication has a long research history within Zooarchaeology. Domestication expects that body size decreases as animals evolve from wild to domesticated varieties, therefore the process of domestication has been

typically observed within the relative body size. Twenty millennia before domestication humans painted pictures of animals on cave walls, leaving messages that scholars now investigate with a variety of tools and analogies (Shanklin, 1985). There is little known about the domestication of Sri Lanka's prehistoric era. But the remains of what is considered a domesticated dog has been reported in the excavations of the Gedige of Anuradhapura (Young & Coningham, 2010). Bos bones have been recovered from Mesolithic levels at Rathnapura (Young, et al., 1999), based on the size of these bones it has been suggested that they may be representative of wild form ancestral to the domesticated cattle now found in Sri Lanka and recovered from the later sites such as Anuradhapura Salgahawatta (Young, et al., 1999; Young & Coningham, 2010)

VI. ANIMALS IN HUMAN SOCIETY

The recent rise in social Zooarchaeology provides evidence that the human-animal relationship goes well beyond subsistence and economy. Animal remains are being used to address questions about the rise of social complexity, rituals, ideology, agency, identity, gender, inequality, and patterns of consumption. As an example, early cultural layers of Batadombalena comprises freshwater shell beads (Perera, et al., 2011; Manamendra-Arachchi & Adikari, 2014). But, beads from marine mollusks shell and stingray spine are present from the earliest cultural layer 7c and layer 7a respectively (Deraniyagala, 1992; Perera, 2010; Perera, et al., 2011; Manamendra-Arachchi & Adikari, 2014). On this occasion marine shells are a rare thing for people in the interior of the country, making ornaments out of a rare thing can give clues to the social stigma.

VII. CONCLUSION

Zooarchaeology can contribute to our understanding of human prehistory and history in a variety of ways. The modern faunal analysis is not considered as isolated subject as it requires a multi-disciplinary vision to pursue its long term research qualities. Although Zooarchaeology has a variety of approaches to employ to address a bunch of questions. Faunal analysis from archeological sites can contribute to the 'bigger picture' questions that archaeologists always wanted to ask.

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