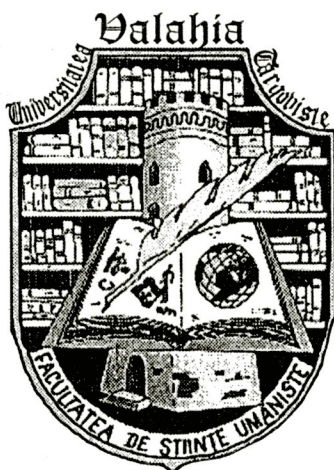


Le Ministère d'Education et de la Recherche
L'Université „Valahia“ Târgoviște
Faculté de Sciences Humaines

ANNALES
D'UNIVERSITÉ „VALAHIA“
TARGOVISTE



SECTION
d'Archéologie et d'Histoire

Tome IV-V

Târgoviște
2002/2003

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ISSN 1584-1855

Producteur : S.C. Editura Logos SRL - Editura Cetatea de Scaun
Str. Mr. Spirescu, Bl. C4, Sc. C, Ap. 2, Târgoviste, jud. Dâmbovita, Roumanie
Tel./Fax. 0245-214692; 0721-209519
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MORTALITY PROFILE AND TAPHONOMY: A LOOK AT HURON DEER PROCUREMENT

*Ildiko Horvath**

Abstract

Faunal assemblages that preserve in the archaeological record and reach the desk of zooarchaeologists are not always representative of past subsistence practices and diet. Taphonomic factors affect bone accumulation, deposition and preservation at archaeological sites and these need to be filtered out before conclusions are drawn about human behaviour and the exploitation of faunal resources. In this study, ethnohistoric references to Huron subsistence are confronted with faunal data from a late prehistoric site. The analysis reveals that taphonomic processes have altered bone deposition and preservation of the faunal assemblage, in general, and of the collection white-tailed deer (*Odocoileus virginianus*) remains, in particular. The mortality profile constructed with the use of NISP counts reveals low relative percentage of young deer in the assemblage. Taphonomic processes, rather than game procurement strategies are invoked as the main causal factor behind such distribution.

Introduction

For the past two hundred years, taphonomy¹ has been an important research tool in the hands of faunal analysts whose main goal has been to learn about the specific relation between the bone assemblage and the archaeological remains, the role people and natural processes played in the accumulation of the faunal assemblage, and, ultimately, the life of the people of the past. Most importantly, taphonomic research can shed light on the attritional processes that alter the composition of the bone assemblage following its deposition and up until its recovery and subsequent analysis, allowing zooarchaeologists to filter out natural processes of bone alteration from culturally-determined processes of bone accumulation. In this study, taphonomy will be employed to assess the rapport between the nature and the composition of the faunal material and the subsistence practices of the people who left behind this material. The research shows that the role played by attritional processes can be significant and these can alter at various levels of bone deposition and preservation the mortality profile of certain animal species that were deposited in the assemblage.

This paper is a case study that is built on the examination of the faunal material from a Huron site in Ontario, Canada and discusses the findings in the context of the archaeological and ethnohistorical information that pertains to this group of people. The study is based on a subset of the faunal material recovered at Seed-Barker site. Following the initial step of taxonomic and element identification, the analysis concentrates on the largest segment of the faunal assemblage, the cranial and post-cranial bones attributed to *Odocoileus virginianus* (white tailed-deer) and discusses the fit between the mortality profile of this species, as represented in the assemblage, and the subsistence practices of the people who resided at this site. Mortality profiles, derived from the relative proportion of animals of a particular species that fall into specific age groups are thought to reflect specific subsistence practices of the people who lived at those sites. An L-shaped (or catastrophic)

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mortality curve, defined by a very large proportion of very young animals of a certain species and a gradual decline in the number of individuals falling in older age groups reflects the age composition of a normal living animal population. At archaeological sites, this pattern is indicative of a hunting strategy that is non-selective and targets whole herds (Munson 1991). Fewer young animals and proportionately more falling in the prime-age group characterize a mortality pattern that deviates from the normal age distribution of a stable deer population and at archaeological sites this pattern generally results from the employment of selective hunting practices that prized prime-aged animals more than the very young or the very old. The results obtained for the faunal assemblage from Seed-Barker clearly illustrate that the pattern indicated by the mortality profile is discordant with the subsistence of the Huron who lived at this site. Fortunately in this case, the subsistence behaviour of the Huron is well documented by ethnohistoric data and these reveal the importance of communal efforts to mass capture deer. Further analysis reveals that taphonomic processes of cultural, natural and biological nature altered the faunal assemblage at this site and the nature of the recovered and analysed faunal assemblage has more to say about processes of bone deposition and preservation than subsistence practices.

The Huron and their subsistence

The Huron were a group of Iroquoian-speaking horticulturists that in the early 17th century inhabited a small area in south-central Ontario, Canada, historically known as Huronia (Ramsden 1990:361). To the east, Huronia was bounded by Lake Simcoe, and to the west by Nottawasaga Bay, the southernmost extension of Georgian Bay. Given its natural surroundings, Huronia resembled an island encircled by water and swamp (Trigger 1990:15). The Huron were egalitarian, tribal-level societies, who at the supra-communal level were organized into a confederacy of allied nations (Latta 1995). Each nation had one or more large villages in which related families resided in spacious longhouses. Some of the Huron villages housed several thousand souls, and it is estimated that, by the contact period, the population of Huronia reached thirty thousand (Latta 1995:10).

The Huron Indians pursued a horticulturalist subsistence that relied primarily on the cultivation of corn, and also of beans and squash. They employed extensive agricultural methods, such as slash-and-burn agriculture, which offered the possibility to harvest a large quantity of cultigens for a number of years, but it also required the people to relocate their villages following each 10 to 30 years cycle of continuous land cultivation and deforestation (Heidenreich 1972:57-69, Trigger 1990). Beyond its immediate purpose, slash-and-burn agriculture offered another advantage for the people who resided in Huron villages. The partially cleared land with secondary growth was a favoured habitat for white-tailed deer (Peterson 1966:324), providing an excellent opportunity for the Huron to mass-capture deer. According to ethnohistoric accounts, the most significant source of protein for the Huron was fish. Fishing was pursued on a year-round basis, using both small and large scale harvesting techniques. Most of the fishing was done with nets, but fishing with wooden spears and hooks was also widespread (Trigger 1990:34).

The Huron complemented their horticultural-fishing economy by gathering wild plants, fruits and seeds, hunting deer and consuming domestic dogs on occasion (Trigger 1990:34-39). White-tailed deer was the single most important meat resource in Eastern North America, which according to ethnohistoric accounts, was abundant in this part of the continent (Waselkov 1978). The presence of deer bones is well documented at Seed-Barker and many other Huron sites (Latta 1995). Dogs were occasionally consumed in

times of food shortage and at feasts, but were also used in hunting expeditions and some were kept as pets (Trigger 1990:39).

Seed-Barker site

Located in Huronia, south-central Ontario, the site of Seed Barker (also known as Little Humber) lies on the bank of the East Humber River on a plateau covered by well drained sandy till deposits (Burgar 1989:5). The location of sites on elevated land and the positioning of these on sandy soils propitious for maize agriculture were general practices followed by the Huron throughout the region (Burgar 1989:5, Heindenreich 1972:18-19, Latta 1995:7).

The artifact assemblage and settlement characteristics suggest that Seed-Barker site was a single component late prehistoric Huron village (Burgar 1989, 1990). Large population aggregates that concentrated in substantial villages surrounded by defensive structures (palisades) were common during the later prehistoric period, referred to as the Realignment period (1500-1600 AD) and the French period (beginning with the 17th century) (Latta 1995:119, Ramsden 1990:382-384). According to estimates, the surface area of Seed-Barker may have reached 5 acres (or approximately 20 thousand square meters), which would have been sufficient to house close to 3000 people (Burgar 1990:19). This site consists of a number of tightly clustered multi-family longhouses and midden deposits scattered along the sides of the houses. The site was fortified, possibly in successive episodes with six rows of palisade that follow the edge of the plateau.

As a large part of the site was destroyed by gravel extractions, archaeological excavations concentrated on the still intact western portion of the site. This segment of the site was also affected by post-depositional disturbance. The plowing of the land resulted in a partially disturbed interface between the shallow topsoil and the artifact-bearing subsoil (Burgar 1989:7). The excavation was carried out with the use of trowels and artifact screening, with the participation of high school and university students (Burgar 1989, Adria Lund personal communication).

Materials and methods

A faunal sample consisting of 1584 specimens was analysed by the present author. These specimens were recovered from 17 different 2x2 m excavation units that represent four distinct, mainly domestic spatial segments of the site. The collection of bone material comprises specimens recovered during the 1987, 1990 and 1992 field seasons.

The collection was subjected to taxonomic identification, ageing and a study of taphonomic alterations. The first analytical step consisted in determining the class to which each specimen belongs. The bone material belonging to each class was subsequently divided into identifiable and unidentifiable specimens. The specimens that were adequately complete or diagnostic to be identified to a narrower taxonomic level were identified to element and side. Age determination was accomplished for the specimens attributed to *Odocoileus virginianus*, based on epiphyseal fusion and dental eruption and wear. For epiphyseal closure, scored according to the chart presented by Purdue (1983), only two stages of skeletal maturation were recorded: lack of fusion and complete fusion. The assessment of age based on dental eruption and wear of cervid teeth is much more tedious to accomplish, given a number of problems. Ageing charts published so far are based on mandibular teeth only, the most widely used being that elaborated by Severinghaus (1949), which was later updated by Taber (1971:388-389). Unfortunately, the highly fragmented

nature of the faunal assemblage from Seed-Barker site impeded the author to confine age determination to complete or nearly complete tooth rows still embedded in fairly complete mandibular *corpi*. This, according to Klein and Cruz-Urbe (1984:45), is a basic requirement in determining the age of skeletal individuals and it is a commonly employed ageing procedure in zooarchaeological research that deals with collections of white-tailed deer (Munson 1991). Two other methods used to determine the age of dental specimens, the count of individual growth rings and measurements of crown height were not employed in this study because of specific methodological implications. Ageing on the basis of growth lines that are formed in cement of the teeth, first applied by Gilbert (1966) to the white-tailed deer has become a widely employed analytical method that allows faunal specialists to estimate the time at death of an animal with a high degree of accuracy (Hesse and Wapnish 1985:76, Hillson 1986:150-166, 226-230, Klein and Cruz-Urbe 1984:44). The study of the incremental lines in cement or dentine is, however, destructive and it requires qualified personnel, specialized equipment and a substantial amount of time. Crown height measurement has been employed as a relative ageing method, suited especially for determining the age of isolated teeth (Hillson 1986:212-214). The interplay between many different variables that affect dental development and wear results in problems that undermine the objective nature and applicability of this ageing criterion. Crown height and the rate of crown attrition can be significantly influenced by the particularities of a specific habitat, diet and idiosyncratic variation (Lyman 1987:129). Furthermore, this method can be most accurately applied to cheek teeth and the measurement may be obscured if the teeth are still mounted in the alveolus (Klein and Cruz-Urbe 1984:46-55). Given these limitations, the author opted to record age categories based on a combination of three relative methods of age determination: epiphyseal fusion, dental development (eruption) and dental wear of isolated mandibular teeth.

The taphonomic analysis of the bone material concentrates upon the study of three kinds of attritional factors: burning (changes in colour), butchering (cut marks) and the impact of biological agents of bone modification (gnawing marks by carnivores). Following Lyman (1994:384-387), the diagnostic criterion used to infer about the extent of burning on a piece of bone is colour. The burnt bone material was subdivided according to four discrete stages of burning. In Stage 1 the bone is partially affected (charred) and it usually becomes dark brown in colour. The temperature in this case is usually less than 500°C. In Stage 2 the bone is completely charred and it becomes black or blue-grey in colour, indicating that it was exposed to a heat that reached up to 700°C. Between 700°C and 900°C (Stage 3) the exposed bone undergoes a transition between a charred stage and calcination. In this process, the bone loses its organic matter and its colour appears to be less homogenous, ranging from grey to light grey and white-grey. Stage 4 refers to bone material that had been exposed to a heat in excess of 900°C, which makes the bone become completely calcined and white in colour. While several faunal analysts have claimed that diagenetic² alterations may often result in colour changes that often mimic but are completely unrelated to changes triggered by burning (Shipman et al. 1984), colour changes are generally recognized as fairly reliable indicators of burning of bone. Structural alterations and shrinkage, also known to accompany bone alterations during exposure to high temperatures (Lyman 1994:385-391) were not analysed by this author.

The diagnostic criteria by which butchering marks were identified are outlined in Lyman (1994:294-314). Cut marks tend to occur mostly on distal limb elements and are represented by V-shaped, usually parallel striations on bones. The gnawing marks that

were identified in the study collection had been produced by two attritional agents: carnivores and rodents. Gnawing by rodents, which resulted in clusters of shallow parallel lines is easily recognizable. In the assessment of carnivore damage the author employed four basic criteria of identification, based on observations made by Binford (1981:51-60) and Lyman (1994:205-216): (1) crenulated edges, typically observable on long bone ends, which are left behind once the epiphyses are completely removed by carnivores, (2) the removal of a significant portion of the cancellous (or spongy) bone tissue from epiphyseal ends of long bones, also referred to as scooping out, (3) pitting or puncture marks created by excessive pressure that is being exerted on the bone surface by sharply cusped single teeth, such as canines or premolars, which can occasionally perforate the bone completely, and (4) randomly scattered striations or tooth scratches that are easily distinguishable from cut marks or root etching. Indirect measures of carnivore damage, such as cracking or channelling of bones while fresh, as well as the relative frequency of long bone shaft elements vis-à-vis long bone ends were excluded from the assessment of carnivore activity at Seed-Barker site because these are not direct clues of carnivore damage and may also be caused by other attritional factors. By limiting the assessment of carnivore damage to directly observable attributes, the extent of the attrition caused by this biological agent (carnivores) on the survival of bone material from Seed-Barker is probably underestimated.

Results

Of the 1584 faunal specimens analysed from Seed-Barker site 89.3%³ come from mammals, while the remaining ten percent is represented by remains of fish, birds and reptiles. As shown in Table 1, the percentage values calculated on the basis of NISP⁴ are relatively close to those obtained by measuring the bone weight (BW), but the frequency values obtained with the use of individual bone count (NISP) is probably a more accurate representation of the relative contribution of the four faunal classes in the assemblage. The percentage by bone weight tends to underestimate the non-mammalian group of animals that generally have smaller and lighter bones and it exaggerates slightly the proportion of skeletally larger and heavier mammals.

Of the mammal bones that are present in the assemblage 13.36% were identified to element, 11.59% to family, 5% to genus, and 4.52% to species. 58.5% of the mammalian specimens identified to family level come from cervids, 51% of which are represented by skeletal fragments attributed to white-tailed deer (*Odocoileus virginianus*). One single specimen has been identified as elk (*Cervus canadensis*), and the remaining 47% are various fragments of cervid bones unidentified to genus or species. Just over 16% of the mammalian assemblage is represented by members of the Muridae family that includes rats, mice and voles, while squirrels account for 16% of the bones in the mammalian class. Carnivores are relatively well represented, accounting for 6.7% of the mammal bones. Canids are the most common carnivores at the site (4.3% of the identified mammals), while bears and weasels account for 1.2% each of the bones that have been identified. Of all identified canid bones 71.4% come from members of the genus *Canis* (dog or wolf). Hares and rabbits make up 1.2% of the identified mammalian assemblage. The American beaver (*Castor canadensis*) and the short-tailed shrew of the Soricidae family are represented by one specimen each.

The division of the ageable specimens attributed to *Odocoileus virginianus* into age groups and the construction of mortality profiles are very difficult tasks to accomplish, given the lack of complete or nearly complete mandibles in this faunal assemblage. The

most accurate ageing method requires the use of fairly complete mandibles, which offers the possibility to determine the exact age of the animals and it also controls for the MNI⁵ in order to ensure that one animal is represented by one specimen only. This ageing method proved to be instrumental in the past to construct mortality profiles of deer populations from a large number of archaeological sites in eastern North America (Lyman 1987, Munson 1991). At Seed-Barker 33% of the ageable white-tailed deer specimens (21 in total) are loose teeth, the rest being post-cranial elements for which fusion data could be recorded. Constrained by the nature of the assemblage, the author opted to calculate the age distribution based on individual specimens, both dental and post-cranial. The age of dental specimens is indicated by tooth eruption and wear and those from the post-cranial skeleton were aged on the basis of epiphyseal fusion, using as reference the epiphyseal closure data compiled by Purdue (1983: Table 3). The use of this method entails that the frequency count on the mortality profile corresponds not to individual skeletons (animals) but to single specimens. In other words, the mortality profile constructed with the deer sample from Seed-Barker is based on NISP and it does not control for the MNI.

This method of calculating the age distribution was the most suitable for the assemblage of white-tailed deer fauna recovered at Seed-Barker, but it is not devoid of inherent biases. Firstly, this method tends to overrepresent those age groups that are better preserved in the assemblage, simply because two or more discrete specimens may come from the same individual. Skeletal element interdependence has been shown to represent a source of problem when NISP is being used to quantify mortality data (Lyman 1987). Secondly, skeletal fusion data, while fairly accurate for young and prime-aged animals, is inapplicable for older age groups, simply because all bones in the post-cranial skeleton of white-tailed deer fuse by 38 months (Purdue 1983: Table 3). Fusion data is a relative measure that tells the analyst that a specific bones comes from a skeletal individual that is at least as old or older than the known time when fusion takes place on that piece of bone, but will not reveal how much older the animal is. A deer with a fused proximal radius may be anywhere between 8 months and 5 years old and the same problem pertains to all other bones in the skeleton that undergo epiphyseal fusion. In order to accommodate this problem, the whole interval of *probable* age has been recorded on the age distribution chart, starting with the minimum age, as indicated by the presence of complete fusion on a particular bone and continuing to the maximum life span of the animal. The age of a fused proximal radius, for instance, is recorded as a range between 8 to over 60 months. By its very nature, this bias tends to inflate mature age groups and the results should be evaluated accordingly.

The age profile constructed for the 21 ageable *Odocoileus virginianus* specimens is presented in Figure 1. The points along the X-axis represent age in months, while the Y-axis marks the individual counts of aged specimens. Each bar parallel to the X-axis corresponds to one observation, which in this case is the age interval of individual specimens. The highest recorded value along the X-axis is 60 months, but this is not necessarily the maximum age individual animals may have reached in this assemblage, as white-tailed deer is known to live even beyond 9 years of age (Munson 1991: Table 1). The 60 months cut-off point is arbitrary, determined to a large extent by the lack of sensitivity of the employed ageing methods in determining the age of white-tailed deer that falls in an older age group. In order to construct a mortality profile based on this frequency distribution, the number of individual specimens has been added up corresponding to each

6 months age intervals. This has been done by counting each bar that falls within the set time intervals. The plotting of these counts is presented in Figure 2.

Figure 2 shows that the youngest age groups are relatively under-represented in the assemblage and the frequency increases in a steady manner up to 24-29 months of age. The right tail of the profile indicates a steady representation of older age groups, however, it should be recalled from the previous discussion that the methodology employed here is less sensitive to this segment of the aged population. The histogram nevertheless reveals that there is a peak in the mortality profile corresponding to the 24-29 month age group, after which the proportion of the animals falling in older age groups declined. The rate of the decline cannot be, however, predicted from the present data.

Previous analyses have revealed a very similar pattern of mortality at a number of archaeological sites. Of the 11 assemblages of white-tailed deer from various historic and prehistoric sites from eastern North America described by Munson (1991), the majority presented a uni-modal distribution with a peak between 24 and 36 months. Although closely comparable to the mortality profile that characterizes the deer assemblage from Seed-Barker, these observations were all drawn from larger samples and calculated the mortality of individual animals (MNI), not of isolated skeletal specimens (NISP).

The mortality profile constructed for the white-tailed deer assemblage from Seed-Barker is very different from the expected age distribution of a dynamic natural deer population. Emerson (1980) showed that in living white-tailed deer populations the percentage of fawns is higher than the relative abundance of older aged animals. The observed contrast between the mortality profile that characterize the archaeological deer population from Seed-Barker and of several other North American sites, on the one hand, and the age profile of natural living deer populations, on the other hand, poses questions about factors that could have led to the underrepresentation of very young animals at these sites.

Discussion

The taphonomic factors that can have the most serious effect on the age composition of a species of fauna in the archaeological assemblage and, more specifically, on the underrepresentation of young animals are the following: (1) the use of selective hunting strategies that specifically target older individuals, (2) differential destruction of bone of very young individuals due to natural processes that often lead to excessive mechanical alterations (fragmentation and abrasion), (3) the impact of cultural processes, such as butchering and burning, and finally (4) attritional damage exerted by biological agents (primarily carnivores).

The preferred hunting strategies employed by the Huron people from southern Ontario are documented in ethnohistoric accounts. A detailed description is provided by Samuel de Champlain, a French soldier, explorer and cartographer, first in line among European travelers who visited and wrote about the Huron. He observed that most of the hunting took place in the fall, when a large number of hunters would come together to cooperate in communal drives (Heindenreich 1972:70-71). Two types of communal drives are mentioned in the literature. One way to hunt white-tailed deer was to form a nearly continuous line of people that would drive whole herds into large triangular enclosures, especially built for this purpose. On other occasions, the animals were driven into a large body of water and killed with arrows and sharpened poles by men standing in canoes (Trigger 1990). Hunting of deer with snares, traps and bows is also mentioned in the

literature, but these practices did not play a significant role in the procurement of white-tailed deer and were largely reserved for the occasional hunting of smaller mammals (Heidenreich 1972:71).

Ethnohistoric literature indicates, therefore, that the Huron primarily employed non-selective methods of deer procurement, such as drives. This method of hunting targets whole herds of animals and it is non-selective against animals of a specific sex or age. The age composition of a faunal assemblage that resulted from the taking of whole herds is expected to mimic the age distribution of a natural deer population, in which the animals belonging to the youngest age category occur in a higher frequency than the segment of the population that falls into any of the older age groups. The age profile of a natural population results in a mortality pattern that is catastrophic or L-shaped, in which unimodal distribution indicates that the youngest age group is the most common, and the proportion of the population falling into older age intervals gradually decreases towards the right end of the tail. With mass capturing methods of deer procurement, such as drives, the faunal assemblage is expected to reflect this mortality pattern (Emerson 1980).

In spite of evidence pointing to the use of communal drives and mass capturing of deer at late prehistoric Huron sites, and quite possibly at Seed-Barker, the age distribution of the ageable white-tailed deer specimens at Seed-Barker does not resemble the catastrophic mortality profile. The bell shaped mortality profile at Seed-Barker, with a peak at the 2-3 year age group resembles more closely the mortality profile of selectively hunted fauna. Stalking with or without a decoy generally targets prime-aged animals, and faunal assemblages that were predominantly obtained by stalking always have a lower percentage of very young and very old individuals (Munson 1991). As suggested by ethnohistorical evidence, stalking was only sporadically employed by the Huron and it is unlikely that this method of game procurement played a major role in the accumulation of white-tailed deer bones at Seed-Barker. Hunting practices do not account for the underrepresentation of the very young animals at this site, which points to the possibility that differential destruction of the bone material may be responsible for the observed age profile.

Natural or cultural taphonomic processes alike are known to exert a significant impact on the survival of particular animal bones. A number of taphonomic studies have shown that there is a strong correlation between the ontogenic age of a bone and the structural density of that particular bone (Lyman 1994:288). The bone of very young individuals has less cortical density than those of older individuals, making the former more susceptible to mechanical alterations and destruction by the force of natural attritional factors. The impact of these taphonomic factors is reflected in the degree of fragmentation of the bone assemblage. At Seed-Barker, 60.6% of the fauna identified in the Cervidae family is fragmented and all of the complete bones come from skeletal parts with high structural density. 40% of the complete cervid bones are carpals, tarsals and sesamoid bones, and 36% are phalanges. Taphonomic experiments have revealed that these bones are structurally denser and withstand more successfully the effects of the mechanical forces of bone alteration (Binford and Bertram 1977, Lyman 1994:234-258, Munson 1991:145-147).

The analysis revealed that, in addition to natural processes, cultural practices also played a major role in the differential destruction of parts of the faunal material at Seed-Barker. Butchering of deer bones is documented in the assemblage by the presence of cutmarks on 0.38% of the analysed bone assemblage. Among fragmented bones, many exhibit signs of spiral fracture, suggestive of fragmentation in green stage. This may

indicate that a high proportion of long bones were butchered and fragmented for marrow while fresh. As with natural attritional factors, the structural density of the bone conditions its survivorship during the butchery process (Lyman 1994:249). Bones of younger animals with lower levels of bone density fracture more easily than those of more mature animals, leading to an underrepresentation of former in the identified faunal assemblage from Seed-Barker.

An ever more significant cultural taphonomic process is burning. Forty-one percent of all the mammal bones analysed from Seed-Barker exhibit signs of burning. Furthermore, a large percentage of the bones affected by burning reveals signs of long-term exposure to high temperature. A minority of the burnt bones (21.8%) was charred to some degree, the remaining 78.2% being exposed to more intense heat that resulted in these becoming calcined or nearly calcined. Beyond colour changes, exposure to high heat can also lead to cracking and shrinkage as the bone loses its organic component (Lyman 1994:386). Since the amount of shrinkage is dependent on the ratio of spongy to compact bone, the degree of alteration suffered by less mineralized, thus more porous bones of very young animals exceeds the level of shrinkage observed on bones of skeletally mature animals (Lyman 1994:387). Because the bones of young animals are more heavily affected by exposure to high heat, it is likely that a larger percentage of the bones coming from skeletally immature deer underwent more dramatic changes that render them unidentifiable. This could explain the lower than expected percentage of ontogenetically younger white-tailed deer in the faunal assemblage from Seed-Barker.

Finally, the impact of biological agents, especially carnivores needs to be assessed in order to fully understand the taphonomic history of bone deposition and preservation at Seed-Barker. It is known from ethnohistoric accounts (Trigger 1990:39) and analyses of archaeological assemblages (Ramsden 1990:380) that domestic dogs were common animals at prehistoric Huron villages. The presence of dogs is attested at Seed-Barker by five specimens identified as belonging to the genus *Canis*. Furthermore, of the total faunal assemblage, 2.26% showed signs of carnivore damage, with birds being more prominently affected by gnawing than members of all other animal classes. As much as 16.66% of bird bones exhibit one or more signs of carnivore gnawing. Separate and carefully controlled actualistic studies have eloquently documented that the extent of carnivore damage on the bone material is closely correlated with the age and structural density of the bones that undergo such destructive processes (Munson 1991). These studies have demonstrated that the survivorship of bones coming from ontogenetically younger individuals is very low, whereas the bones of adult animals survive the effects of scavenging at a much higher rate. Dogs can completely destroy and consume mandibles of young deer, and this could probably explain the lack of mandibular specimens in this assemblage. Of the 11 complete or partially preserved white-tailed deer teeth only four indicate an ontogenetic age below 24 months, revealing the possibility that the teeth of some of the youngest animals may have been consumed or destroyed at a higher rate.

These observations on the nature of the faunal assemblage from Seed-Barker suggest that the bone material deposited at this site had been exposed to a number of natural, cultural and biological attritional processes. Natural and cultural sources of taphonomic destruction explain the differential destruction and underrepresentation of bones of very young animals, while carnivores, as biological agents of bone modification, were probably the main attritional factor responsible for the complete removal (destruction) of teeth belonging to young cervids. Carnivore activity played probably the leading role in the

taphonomic history of bone deposition and preservation at Seed-Barker site. Research at other prehistoric sites from eastern North America attest that similar processes were responsible for the accumulation and preservation of animal bones at those sites (Munson 1991).

While the ageing of isolated dental and post-cranial specimens and the construction of mortality profile opened the possibility to learn about the acquisition, utilization and taphonomic attrition of the deer assemblage from Seed-Barker, this study is not devoid of biases of methodological nature that render the conclusions preliminary. Foremost, it has been stressed at the beginning that all age determinations and the mortality profile were obtained with the use of individual specimens and not actual skeletal individuals. Lyman (1987) has shown that mortality profiles can be most accurately derived from age class frequencies when the latter are defined on the basis of individual animals (MNI). Although Lyman (1987) recommends the use of MNI over NISP to derive mortality profiles, his comparative study reveals that out of four faunal assemblages, in only one case did the mortality profile based in NISP counts deviate from the pattern that was established on the basis of MNI values (Lyman 1987:Figures 5 and 6). This reveals that a MNI-based approach to mortality profiles may be more accurate, however, this does not render NISP-based age profiles useless, especially in instances in which sample size is small and MNI values are not available. The second shortcoming regards sample size. This analysis was built on a sample that contains 21 ageable cranial and post-cranial elements, while most age profiles have been generally constructed with the use of larger data sets. Lyman (1987) recommends the use of at least 30 ageable individuals to derive mortality profiles, while according to a more conservative estimate (Munson 1991:142), there should be at least 50 skeletal individuals in a sample in order to calculate a valid mortality profile. A more ample analysis, built on a larger sample that encompasses faunal material recovered not only in several excavation units, but from all excavated spatial segments of the site can lead to a more integral view on the depositional and preservation factors that affected the collection of bone material at Seed-Barker and provide a more comprehensive data set on which mortality profiles can be constructed in future analyses.

Conclusions

The present analysis has shown that the relative representation of aged white-tailed deer specimens is not an accurate indicator of past diet and subsistence strategies. A simplistic assessment and recording of the actual or preserved faunal material should not suffice analysts of zooarchaeological collections, as this may provide faulty information about the activities and subsistence practices of the people who accumulated and left behind these animals or animal parts. The preserved or sample assemblage that is available for zooarchaeologists to study is not the same as the death assemblage, which at archaeological sites is usually an artifact of past subsistence behaviour and cultural practices. These assemblages represent very different levels of taphonomic history in any zooarchaeological assemblage, with a whole array of processes that act in between to alter the death assemblage via deposition and bone preservation (Klein and Uribe-Cruz 1984, Meadow 1980, Reitz and Wing 1999:110-112, Ringrose 1993). Without the benefit of taphonomic analyses, several earlier studies on white-tailed deer use at North American archaeological sites have established a faulty connection between the low percentage of very young white-tailed deer in faunal assemblages of a number of eastern North American sites and selective hunting practices that favoured prime-aged animals (Elder 1965, Smith

1975). In a landmark study, Munson (1991) has clearly demonstrated the fallacy in this assumption and assembled a large data set that allowed him to conclude that while the majority of historic and prehistoric Eastern North American sites that yielded sizable collections of white-tailed deer bones have a relatively higher frequency of prime-aged deer in their assemblages, predepositional attrition on bones and scavenging by dogs played the primary role in altering the frequency of age classes on the mortality profiles.

This analysis on bone taphonomy has revealed similar attritional processes acted on bone preservation at late prehistoric Huron sites where white-tailed deer played an equally significant role in the diet. At Seed-Barker site young deer are under-represented in the assemblage, compared to the higher relative representation of adult age groups between 18 to 36 months of age. Natural and cultural taphonomic processes may be responsible for the higher rate of attrition on bones of young deer, while scavenging dogs may account for the complete removal of mandibles belonging to ontogenetically young animals. Dogs were frequently used for hunting and it is very probable that once a hunting operation was completed, many young deer were scavenged right where the kill took place. Carnivore damage may have been amplified by scavenging on bones that were discarded after human use back at the habitation site. The overall composition of the faunal material and the low percentage of fish bones by NISP and weight also point to severe attritional factors. Ethnohistoric references document the importance of fish in Huron diet, while this analysis found that fish made up a proportionately small part of the faunal assemblage at Seed-Barker. As with the remains of young mammals, fish discarded after human processing and consumption may have become a food item for dogs or wolves.

This zooarchaeological analysis was facilitated by access to direct ethnohistoric references to the life of the people who lived in Huronia around the time of the contact. Taphonomic research need not, however, limit its scope to places and times of the human past for which such direct information is available. The study of bone taphonomy is instructive in any context, inasmuch as it leads to a more accurate understanding of the relationship between human activities and the preserved record of the past.

Acknowledgments

This paper is based on a student essay written in 1996, while at the University of Toronto. Access to the collection of faunal material from Seed-Barker was facilitated by Professor James Barret who has also provided helpful comments on an earlier version of this paper. Some of the theoretical and methodological leads followed in this study took shape over the course of many discussions that involved all of us who took the Zooarchaeology course at the University of Toronto in the spring of 1996. While I gratefully acknowledge the guidance and support of all who made this paper possible, I assume sole responsibility for all the methods of quantification used in this study and ideas expressed herein.

Notes

- ¹ Taphonomy, as defined by Lyman (1994:1) is the study of processes of preservation and how they affect information that pertains to the archaeological record or parts of it (faunal or botanical remains).
- ² Diagenesis refers to post-burial factors (chemical or physical) of bone alteration. For a comprehensive list of definitions see Lyman (1994:506).
- ³ Throughout the paper, all number figures follow the North American system of notation, where points are used to set off decimals and comma represents number divisions that are used to separate units of three in numbers that exceed one thousand.
- ⁴ NISP stands for the Number of Identified Specimens, an observational quantitative unit used to signify the sum of all skeletal specimens (complete bones or fragments) that had been identified to a specific taxonomic level (in this case class).
- ⁵ MNI stands for the Minimum Number of Individuals, a derived analytical unit that represents the minimum number of individual animals necessary to account for a specific number of skeletal elements. The skeletal element is a single complete bone or tooth or a diagnostic portion of a complete bone from the skeleton that may be composed of multiple specimens (bone fragments) or a single one, if this is a complete bone (ex. right humerus) or complete diagnostic portion of that bone (ex. right distal humerus). For single elements, such as the skull or sternum, the calculation of MNI is relatively uncomplicated (five complete skull indicate 5 individual animals), but for elements that are paired (ex. humeri) or multiple (ex. vertebrae) this is slightly more complex. The most common way to calculate MNIs for paired elements is to calculate first the sum of each element (ex. 7 left humeri and 8 right humeri) and take the maximum value (in this case 8) as the MNI. If all other skeletal elements occur in smaller numbers, you may take this value as the MNI in the assemblage. (See for further elaboration Lyman 1994:100-102 and Ringrose 1993:126).

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Table 1. Relative frequency of faunal classes identified at Seed-Barker, based on NISP (Number of Identified Specimens) and BW (Bone Weight).

Class	% by NISP	% by BW
Mammalia	89.33%	98.37%
Osteichthyes	9.28%	1.17%
Aves	1.14%	0.35%
Reptilia	0.25%	0.11%
Total	100%	100%

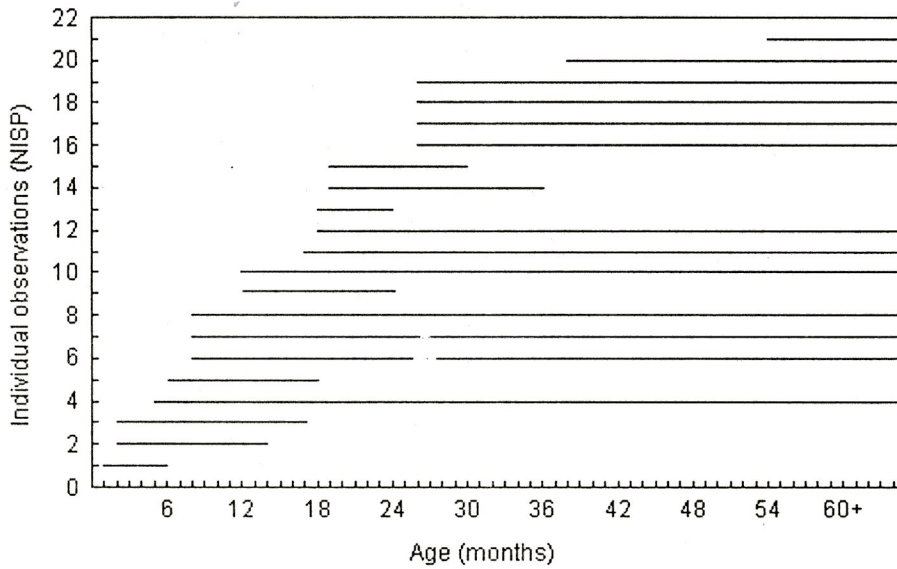


Fig. 1. Age class frequency of white-tailed deer (*Odocoileus virginianus*) at Seed-Barker.

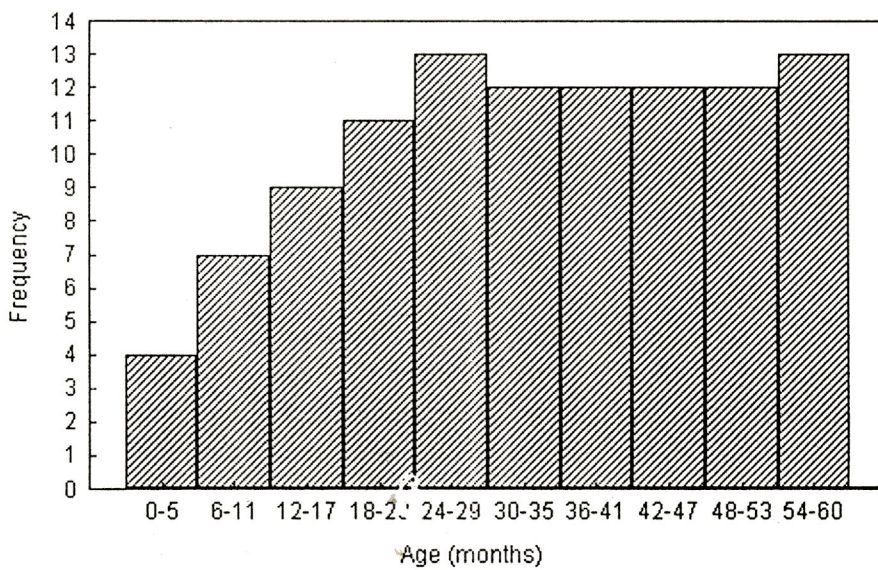


Fig. 2. Mortality profile of aged white-tailed deer (*Odocoileus virginianus*) at Seed-Barker (based on NISP counts).