Deer, Passenger Pigeons, and Hunter-Gatherers: Late Archaic Subsistence and Seasonality in Central New York

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Abstract

Animal bones from the Lamoka Lake and Cole Gravel Pit sites in central New York are used to investigate Late Archaic hunter-gatherer subsistence, mobility, and diet breadth. Zooarchaeological and taphonomic analysis indicate that both assemblages have been modified by human and carnivore activity. Multiple lines of evidence indicate that both sites were occupied for multiple seasons and possibly year-round. White-tailed deer and passenger pigeon were two of the most important species used, but the relative importance of each species varied seasonally.

Introduction

Between 1925 and 1928, William Ritchie and Harrison Follett excavated the Lamoka Lake site in central New York. Based on their finds there, Ritchie defined the non-agricultural, non-ceramic Archaic period (Ritchie 1932). This name was quickly adopted by other archaeologists and applied to similar sites in other areas of North America (Mason 1981; Willey and Phillips 1958). Since it was first defined, the Archaic has been identified as a cultural tradition of seasonally mobile hunter-gatherers. Ritchie, like most archaeologists, thought that Late Archaic base camps were occupied only seasonally, but Lamoka Lake's thick midden deposits and the large number of features, artifacts, and animal bone found there led him to argue for year-round occupation of this particular site (Ritchie 1969:76), making Lamoka something of an anomaly, especially in the Northeast.

Archaeologists have increasingly recognized the complexity inherent in hunter-gatherer groups (e.g., Ames 1994; Arnold 1996; Price and Brown 1985). For example, not all hunter-gatherers lived in small groups, and not all were seasonally mobile. Was the Lamoka Lake site occupied year-round? Is the site an anomaly in the Northeast Late Archaic? In what ways were northeastern hunter-gatherers complex? I analyzed animal bones from Lamoka Lake and the Cole Gravel Pit site, another Late Archaic site in central New York state (Figure 1), in an attempt to answer these questions.

Both Lamoka Lake and Cole Gravel Pit date to the Lamoka Phase of the Late Archaic period, approximately 4,500 – 3,800 B.P. The Lamoka Lake site is located in Tyrone Township, Schuyler County, New York State, on the eastern shore of a small stream about 1.13 km long that connects Waneta Lake to the north with Lamoka Lake to the south. Following initial excavation by an amateur collector in 1924 and 1925, William Ritchie, sponsored by the Rochester Museum of Arts and Sciences (now the Rochester Museum and Science Center [RMSC]), conducted fieldwork at the site in 1925. Much more extensive work was conducted by Ritchie and Harrison Follet in 1927 and 1928. Limited excavations were undertaken at Lamoka Lake by the New York State Museum in 1958 and 1962 (Ritchie 1969), in 1981 and 1987 by the Buffalo Museum of Science (Gramly 1983), by Tony Luppino as a Utica College field school in the early 1990s, and by Rutgers University in 2000.

The Cole Gravel Pit site, in Caledonia Township, Livingston County, New York, is located on a terrace on the west bank of the Genesee River approximately 32 km south of Rochester. The recognition of archaeological features during commercial gravel stripping at Cole Gravel Pit led to salvage excavations by the RMSC between 1966 and 1971 that resulted in the excavation of 296 features and 16 human burials (Brown et al. 1973; Hayes 1966; Hayes and Bergs 1969).

Zooarchaeology

Abundant animal remains were recovered from all excavations at Lamoka Lake. The 1925-1928 excavations at Lamoka Lake recovered over 500 pounds of bone (Ritchie 1932), but when I started my study, almost all of these had been lost (but see Bodner 1995; Madrigal 1999:87-89). I was able to study almost 4,000 bones from early excavations that were still curated at the RMSC. Animal remains from the New York State Museum excavations were studied by Guilday (in Ritchie 1969) and more recent work has examined faunal remains from the other fieldwork (Madrigal 1999, 2000; Pante 2001; Versaggi et al. 2001). This study will focus on the RMSC and Luppino excavations at Lamoka Lake. The Cole Gravel Pit faunal assemblage was first analyzed by Brown and colleagues (1973) and more recently re-analyzed by Madrigal (1999).

The Lamoka Unscreened Assemblage

The RMSC Lamoka assemblage contains 3,758 bones of which 2,099, or just over half (56%), were minimally identifiable to Class (Table 1). White-tailed deer is the most common species

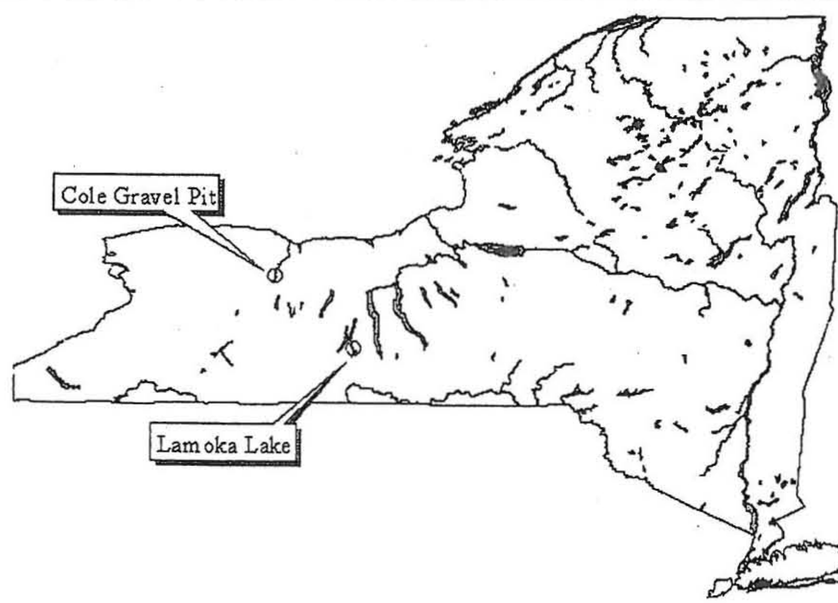

Figure 1. Map of New York state showing the location of Lamoka Lake and Cole Gravel Pit archaeological sites.

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and comprises about half (n=1042) of all identified bones. At least 37 individual deer are represented. The next most common species is turkey, comprising at least 15 individuals but less than 5% of all identified bones. This assemblage is a fraction of the total number of bones originally excavated between 1925 and 1928. Screening was not used during this excavation, so this is called the Lamoka unscreened assemblage.

The Lamoka Screened Assemblage

The total number of bones from the Utica College assemblage, excavated by Tony Luppino, has not been tabulated, but 3,797 animal bones were analyzed for this study. Of these, 1,627, or 43%, were minimally identifiable to Class (Table 2). White-tailed deer is the most abundant animal, represented by 234 bones, followed distantly by passenger pigeon (n=105), gray squirrel/tree squirrel (n=62), and bullhead catfish (n=55). In terms of minimum number of individuals (MNI), however, passenger pigeon is the most abundant, with at least 13 individuals, followed by bullhead catfish (MNI=10) and deer (MNI=6). All soil from this excavation was screened through quarter-inch mesh, so this is called the Lamoka screened assemblage.

Cole Gravel Pit

A total of 16,180 bones, of which 8,174 (51%) were minimally identifiable to Class, were excavated at Cole Gravel Pit (Table 3). The most abundant species is tree squirrel (including gray and fox squirrel), represented by 786 bones and at least 40 individuals. Deer is the next most common species (n=691, MNI=20), followed by passenger pigeon (n=414, MNI=67). Virtually all faunal remains were recovered from features. After features were uncovered by mechanical equipment, excavation was conducted with shovels and trowels. In most cases, soil was screened through quarter-inch mesh. However, because several different volunteers participated in the excavations, not always under the direct supervision of professional archaeologists, there was variation in excavation techniques used (Hayes 1966; Hayes and Berg 1969).

Taphonomy

None of the three assemblages appears to have suffered from any significant post-depositional taphonomic disturbance: there is little evidence for weathering, trampling, or diagenetic destruction. There is, however, abundant evidence for carnivore gnawing, in the form of tooth marks and acid etching. This affects interpretation of the assemblages, as discussed below.

The Unscreened Lamoka assemblage, not surprisingly, contains very few small animal bones and bone fragments are, on average, larger than bone fragments in the other two assemblages. The lack of screening also has affected deer skeletal element representation, resulting in the underrepresentation of both small elements like phalanges, and small fragments of larger bones. The Screened Lamoka assemblage, in contrast, contains a greater proportion of very small bones and small bodied animals, including birds and fish, than the Unscreened Assemblage. Deer also tends to be represented by small elements, such as carpals, tarsals, and phalanges, and by small fragments of larger elements, such as long bone mid shaft fragments.

The Unscreened Assemblage, because it has a large number of deer bones, can be used with caution to study deer hunting and butchery patterns, but because of the lack of screening, it does not provide an accurate picture of diet breadth or small animal use. In contrast, the Screened Assemblage, because it has a smaller number of deer bones that tend to be highly fragmented, is less useful for studying deer use, but can be used to study diet breadth and the relative importance of different species. The Cole Gravel Pit assemblage has both a large number of deer bones and good recovery of small and large animals.

Seasonality

The season or seasons that a site was occupied is particularly important because it provides evidence for the degree of mobility or sedentism. Animals at both sites are consistent with multi-seasonal occupation. Deer teeth and bones provide the most abundant, but not always precise, evidence of seasonality. Of 87 Unscreened Assemblage deer mandible fragments, 14 are from individual less than two years old, from which estimates of season of death can be derived from tooth eruption and wear (Severinghaus 1949). Of these, six indicate death in the fall or winter; five in winter or spring; two in spring; and one in summer or fall. Only two mandible fragments with teeth were recovered from the Screened Assemblage and neither provided reliable seasonality estimates.

Most deer long bones do not provide precise seasonal estimates based on epiphyseal fusion (Purdue 1983), but at least five bones from fawns indicate a summer to fall death, and one partially fused first phalanx reliably indicates a late spring to summer death.

At Cole Gravel Pit, two mandibles are from yearlings killed sometime between July and October. One feature at Cole also contained the fragmented bones of a single fawn that, based on the presence of a fused proximal radius and unfused distal humerus, was approximately five months old at the time of death. This indicates a death in the fall, around November. Five deer frontal bone fragments were found, but none retain the antlers. Erosion of the pedicle makes it difficult to determine if antlers were attached at the time of death, but two specimens appear to have had shed antlers, indicating a winter death, and one may have had an attached antler, indicating a spring to fall/early winter death. In addition, one complete antler with a pedicle was found. This antler is completely calcified, indicating a late summer to early winter death. In summary, most of the seasonality information from deer indicates fall or winter kills, but there is clear evidence that some deer were also killed in the spring and summer.

Bones from other animals provide additional seasonality information. The presence of passenger pigeon bones from both sites suggests a spring occupation, although pigeons may also have been obtained in lesser numbers during the summer and fall (see discussion below). More precisely, medullary bone deposits (a tissue found in the interior cavities of bones of breeding females before or immediately after eggs were laid [see Rick 1975]) found in some passenger pigeon bones provide reliable evidence for the killing of adult female birds in March and April. Medullary bone deposits in some turkey bones indicate a slightly later spring death.

Spotted turtle and bog turtle bones, found only at Cole Gravel Pit, are thought to represent natural deaths and most likely indicate an April to June death.

Evidence for summer occupation is present but more limited. One woodchuck incisor from Cole is, based on size (Munson 1984), from a juvenile killed in June or July. Less precise indicators of warm weather occupation include the presence of frogs, toads, most turtles, catfish, and sunfish at both sites.

Migratory ducks and geese, which are relatively uncommon at both sites, most likely indicate autumn deaths (although these birds may also have been taken during the spring migration). With the exception noted above, most woodchucks at both sites were almost certainly killed in the autumn when they are both active above ground and in prime condition with a high fat content.

Aside from deer, few other animals reliably indicate winter kills, although bear and snapping turtle at both sites, and a single canvasback duck specimen at Lamoka Lake, may all have been killed during winter months. In sum, a suite of faunal evidence indicates, at the least, multi-season occupation of both Lamoka Lake and Cole Gravel Pit. Both sites were probably continuously occupied year-round, although the number of people present at any given time would vary as different logistical groups traveled to other locations to procure food or other resources, which were apparently brought back to these two sites.

Table 1. Faunal remains from the Lamoka Lake Unscreened Assemblage (RMSC Excavation). NISP = Number of identified specimens; MNI = Minimum number of individuals; * =less than 0.1% of total. "cf." identifications included with definite identifications.

Class	Taxon	Common Name	NISP		MNI	
Reptilia	Testudines	turtle	54	2.6%	1	1.3%
Aves	Anatidae	duck, goose, or swan	1	*	1	1.3%
	Accipitridae	hawk or eagle	1	*	1	1.3%
	Meleagris gallopavo	turkey	95	4.5%	15	19.0%
	Ectopistes migratorius	passenger pigeon	3	*	2	2.5%
	Strix varia	barred owl	2	0.1%	1	1.3%
		indet. bird	160	7.6%		
Mammalia	*Homo sapiens*	human	1	*	1	1.3%
		carnivore	18	0.9%		
		small carnivore	6	0.3%		
	cf. *Canis lupus*	cf. wolf	1	*	1	1.3%
	Canis sp.	canid	5	0.2%		
	Urocyon cineroargentus	gray fox	1	*	1	1.3%
	Vulpes/Urocyon	red or gray fox	5	0.2%	2	2.5%
	Mephitis mephitis	striped skunk	2	0.1%	1	1.3%
	Procyon lotor	raccoon	12	0.6%	3	3.8%
	Ursus americanus	black bear	16	0.8%	1	1.3%
	cf. *Cervus canadensis*	cf. wapiti	3	*	1	1.3%
	Odocoileus virginianus	white-tailed deer	1,042	49.6%	37	46.8%
	Cervidae	cervid	146	6.9%		
	Castor canadensis	beaver	10	0.5%	3	3.8%
	Erethizon dorsatum	porcupine	2	0.1%	1	1.3%
	Ondatra zibethicus	muskrat	1	*	1	1.3%
	Marmota monax	woodchuck	4	0.2%	2	2.5%
	Sciurus sp.	tree squirrel	9	0.4%	2	2.5%
	Sylvilagus floridanus	eastern cottontail	1	*	1	1.3%
	Rodentia	rodent	5	0.2%		
		indet. mammal	548	26.1%		
		Total Identifiable	2,099	100%	79	100%
		Not Identifiable	1,659			
		Grand Total	3,758			

Table 2. Faunal remains from the Lamoka Lake Screened Assemblage (Luppino Excavation). Abbreviations as in Table 1.

Class	Taxon	Common Name	NISP		MNI	
Pisces	Cyprinidae	minnows	1	0.1%	1	1.4%
	Catostomidae	suckers	7	0.4%	1	1.4%
	Ameiurus sp.	bullhead catfish	55	3.4%	10	13.7%
	cf. Ictaluridae	cf. catfish	2	0.1%		
	Percidae	perches	8	0.5%	3	4.1%
	Lepomis gibbosus	pumpkinseed	5	0.3%	3	4.1%
		fish	129	7.9%		

Table 2 cont. Faunal remains from the Lamoka Lake Screened Assemblage (Luppino Excavation). Abbreviations as in Table 1.

Amphibia	*Rana catesbeiana*	bullfrog	1	0.1%	1	1.4%
		frog or toad	7	0.4%		
Reptilia	*Sternotherus odoratus*	common musk turtle	7	0.4%	1	1.4%
	Chelydra serpentina	snapping turtle	1	0.1%	1	1.4%
	Chrysemys picta	painted turtle	3	0.2%	1	1.4%
	Graptemys geographica	common map turtle	2	0.1%	1	1.4%
	Terrapene carolina	common box turtle	12	0.7%	2	2.7%
		Turtle	46	2.8%		
	Nerodia sipedon	northern water snake	1	0.1%	1	1.4%
		colubrid snake	4	0.2%		
	Viperidae	vipers	7	0.4%	1	1.4%
		snakes	3	0.2%		
Aves	*Ardea herodias*	great blue heron	1	0.1%	1	1.4%
	cf. *Aix sponsa*	cf. wood duck	1	0.1%	1	1.4%
	Anas cf. *discors*	cf. blue-winged teal	2	0.1%	1	1.4%
	Aythya valisineria	canvasback	1	0.1%	1	1.4%
	cf. *Branta canadensis*	cf. Canada goose	1	0.1%	1	1.4%
		duck, goose, or swan	7	0.4%		
	Bonasa umbellus	ruffed grouse	5	0.3%	1	1.4%
	Meleagris gallopavo	turkey	23	1.4%	2	2.7%
	Ectopistes migratorius	passenger pigeon	105	6.5%	13	17.8%
		indet. bird	235	14.4%		
Mammalia	*Canis lupus*	wolf	1	0.1%	1	1.4%
	Vulpes vulpes	red fox	1	0.1%	1	1.4%
		red or gray fox	2	0.1%		
	Mephitis mephitis	striped skunk	1	0.1%	1	1.4%
	Procyon lotor	raccoon	7	0.4%	1	1.4%
	Ursus americanus	black bear	6	0.4%	1	1.4%
	cf. *Cervus canadensis*	cf. wapiti	2	0.1%	1	1.4%
	Odocoileus virginianus	white-tailed deer	234	14.4%	6	8.2%
		cervid	4	0.2%		
	Castor canadensis	beaver	1	0.1%	1	1.4%
	Erethizon dorsatum	porcupine	2	0.1%	1	1.4%
	cf. *Peromyscus* sp.	cf. deer/white-footed mouse	1	0.1%	1	1.4%
	Ondatra zibethicus	muskrat	6	0.4%	1	1.4%
	Marmota monax	woodchuck	11	0.7%	2	2.7%
	Sciurus carolinensis	gray squirrel	1	0.1%		
	Sciurus sp.	tree squirrel	61	3.8%	4	5.5%
	Tamias striatus	eastern chipmunk	7	0.4%	2	2.7%
		rodent	5	0.3%		
	Lepus americanus	snowshoe hare	1	0.1%	1	1.4%
		indet. mammal	591	36.3%		
		Total Identifiable	1,627	100%	73	100%
		Not Identifiable	2,170			
		Grand Total	3,797			

Table 3. Faunal Remains from the Cole Gravel Pit. * =less than 0.1% of total. Abbreviations as in Table 1.

Class	Taxa	Common Name	NISP		MNI	
Pisces	Cyprinidae	minnows	2	*	1	0.3%
	Catostomidae	suckers	5	0.1%	1	0.3%
	Ameiurus nebulosus	brown bullhead	4	*	2	0.7%
	Ameiurus sp.	bullhead catfish	21	0.3%	5	1.7%
	Ictalurus punctatus	channel catfish	2	*	1	0.3%
	Ictaluridae	catfish	15	0.2%	4	1.3%
	Morone sp.	temperate bass	5	0.1%	3	1.0%
	Lepomis sp.	sunfish	2	*	1	0.3%
	Centrarchidae	sunfish	6	0.1%	3	1.0%
	Percidae	perches	1	*	1	0.3%
		fish	1,174	14.4%		
Amphibia	*Bufo* sp.	toads	12	0.1%	2	0.7%
	Rana sp.	true frog	19	0.2%	5	1.7%
	Anura	frog or toad	33	0.4%	5	1.7%
Reptilia	*Sternotherus odoratus*	common musk turtle	2	*	1	0.3%
	Chelydra serpentina	snapping turtle	10	0.1%	2	0.7%
	Chrysemys picta	painted turtle	5	0.1%	2	0.7%
	Clemmys guttata	spotted turtle	8	0.1%	4	1.3%
	Clemmys muhlenbergii	bog turtle	8	0.1%	4	1.3%
	Clemmys sp.	bog or spotted turtle	14	0.2%		
	Terrapene carolina	common box turtle	104	1.3%	12	4.0%
	Trionyx spiniferus	spiny softshell turtle	3	*	1	0.3%
	Testudines	Turtle	384	4.7%		
	Squamata	snakes	2	*	1	0.3%
	Colubridae	colubrid snake	164	2.0%	1	0.3%
Aves	*Ardea herodias*	great blue heron	2	*	1	0.3%
	Aix sponsa	wood duck	2	*	1	0.3%
	Anas platyrhyncos /rubripes	mallard or black duck	14	0.2%	3	1.0%
	Branta canadensis	Canada goose	3	*	1	0.3%
	Chen caerulescens	snow goose	3	*	1	0.3%
	Lophodytes cucullatus	hooded merganser	1	*	1	0.3%
		duck, goose, or swan	1	*		
		goose or swan	3	*	1	0.3%
		medium duck	23	0.3%	4	1.3%
		small duck	5	0.1%	2	0.7%
	Buteo jamaicensis	red-tailed hawk	1	*	1	0.3%
	cf. *Haliaeetus leucocephalus*	cf. bald eagle	1	*	1	0.3%

Table 3 cont. Faunal Remains from the Cole Gravel Pit. * =less than 0.1% of total. Abbreviations as in Table 1.

	Bonasa umbellus	ruffed grouse	25	0.3%	3	1.0%
	Meleagris gallopavo	turkey	136	1.7%	12	4.0%
	Scolopax minor	American woodcock	1	*	1	0.3%
	Ectopistes migratorius	passenger pigeon	414	5.1%	67	22.4%
	Strigiformes	owls	1	*		
	Strix varia	barred owl	2	*	1	0.3%
	Colaptes auratus	northern flicker	2	*	1	0.3%
	Dryocopus pileatus	pileated woodpecker	1	*	1	0.3%
	Passeriformes	perching birds	1	*		
	Turdus migratorius	American robin	1	*	1	0.3%
		indet. bird	1,046	12.8%		
Mammalia	*Vulpes/Urocyon*	red or gray fox	3	*	1	0.3%
	Canis familiaris	dog	1,212	14.8%	3	1.0%
	Canis sp.	canid	4	*		
	Ursus americanus	black bear	42	0.5%	2	0.7%
	Procyon lotor	raccoon	46	0.6%	10	3.3%
	Lutra canadensis	river otter	2	*	1	0.3%
	Mephitis mephitis	striped skunk	4	*	1	0.3%
	Lynx rufus	bobcat	1	*	1	0.3%
	Carnivora	carnivore	8	0.1%		
	Carnivora	small carnivore	2	*		
	Cervus canadensis	wapiti	13	0.2%	2	0.7%
	Odocoileus virginianus	white-tailed deer	691	8.5%	20	6.7%
	Cervidae	cervid	109	1.3%		
	Glaucomys sabrinus	northern flying squirrel	3	*	1	0.3%
	Glaucomys volans	southern flying squirrel	79	1.0%	13	4.3%
	Marmota monax	woodchuck	40	0.5%	9	3.0%
	Sciurus carolinensis	gray squirrel	5	0.1%	2	0.7%
	Sciurus niger	fox squirrel	2	*	1	0.3%
	Sciurus sp.	tree squirrel	779	9.5%	40	13.4%
	Tamias striatus	eastern chipmunk	70	0.9%	14	4.7%
	Tamiasciurus hudsonicus	red squirrel	27	0.3%	5	1.7%
	Castor canadensis	beaver	20	0.2%	2	0.7%
	Peromyscus leucopus	white-footed mouse	1	*	1	0.3%
	Microtus cf. *pennsylvanicus*	cf. meadow vole	3	*	1	0.3%
	Ondatra zibethicus	muskrat	12	0.1%	2	0.7%
	Muridae	vole or lemming	2	*		
	Muridae	rat, mouse, or vole	3	*		
	Erethizon dorsatum	porcupine	1	*	1	0.3%
	Rodentia	rodent	72	0.9%		
		indet. mammal	1,224	15.0%		
		Total Identifiable	8,174	100%		
		Not Identifiable	8,006			
		Grand Total	16,180		299	100%

Diet Breadth

There are 53 different animal taxa identified at Cole Gravel Pit and 52 taxa identified among the Lamoka Lake assemblages. A small number of these species, such as mice and voles, likely are intrusive fauna not used by humans for food, but the majority of species represent food remains, as indicated in many cases by direct evidence from bone modification marks.

A specialized diet in which only a few species are included in the optimal diet is expected in rich environments where high-ranked prey are so abundant that there is no need to procure prey with lower net yields (MacArthur and Pianka 1966; Winterhalder 1981). That appears to be the case, at least during certain seasons, at both Cole Gravel Pit and Lamoka Lake, despite the large number of different species found. At Cole, only three species were preferentially exploited: tree squirrel (primarily gray squirrel, although some fox squirrel specimens were found), white-tailed deer, and passenger pigeon. The Lamoka Lake assemblages indicate a strategy focused on deer, passenger pigeon and catfish. Diet at both sites, however, undoubtedly varied seasonally, with different animals targeted as they became most abundant, attained their maximum seasonal weight, or were most efficiently captured.

During the fall and winter, deer probably constituted the greater part of the animal diet. Deer abundance and quality would have declined precipitously by the end of winter and early spring, so there may have been a very lean period until the migratory passenger pigeons arrived in the early spring. From late spring to early fall, diet breadth probably widened to include fish, squirrels, other small mammals, and other birds, as no single species dominated the diet. Fish have long been considered an important food resource at Lamoka Lake, primarily due to the large number of netsinkers recovered from the site (Ritchie 1932), but the lack of flotation analysis makes it difficult to quantify in any way the relative importance of fish at either site.

Two of the species used by Late Archaic inhabitants of central New York are particularly important for understanding hunter-gatherer behavior. The use of white-tailed deer and passenger pigeon is discussed in more detail in the following sections.

White-tailed Deer

Deer skeletal element profiles at Lamoka Lake and Cole Gravel Pit do not provide any evidence for the differential transport of high-yield meat parts to either site. There is evidence, however, that bones with higher marrow yields are more common than those with low yields. This does not mean that high-yield marrow bones were preferentially transported to the site. Instead, it is more likely that these profiles indicate preferential processing of high-yield marrow bones *after* entire deer carcasses were transported to the sites (Madrigal and Capaldo 1999; Madrigal and Holt 2002).

The abundance and location of carnivore tooth marks and human cut marks and percussion marks on deer bones at both sites indicate that Late Archaic hunter-gatherers were processing deer for meat and bone marrow, but probably were not systematically boiling bones to extract bone grease (see discussion in Madrigal 1999; Madrigal and Capaldo 1999; Madrigal and Holt 2002). After deer bones were discarded by humans, they were scavenged by carnivores, presumably domestic dogs, who chewed them to obtain any remaining nutrients.

Both deer behavioral ecology and ethnohistoric records (Cavallo 1991; McCabe and McCabe 1984) indicate that deer hunting would have been most important during autumn and winter, when deer aggregate in winter yards (Cavallo 1991; Cook and Hamilton 1942). Yarding puts deer in a high density, spatially restricted, seasonally predictable location, which would have been ideal for Late Archaic hunters in need of a reliable, high yield food source during the cold season. Deer yards could be expected to attract large numbers of people to the area, but efficient hunting of these deer would not have required organized communal hunting. Neither site provides evidence of systematic bulk processing of deer carcasses, so it is unlikely that large numbers of deer were obtained at one time and then systematically butchered and distributed. Instead, deer procurement at these winter yards may have been carried out by individuals or small family groups.

Passenger Pigeon

Passenger pigeons were highly migratory birds that wintered in the southern United States and migrated north in the very early spring (Schorger 1973). New York state was in the center of their prime breeding territory. Numerous historic accounts describe how enormous flocks of migrating pigeons would stretch for miles, take all day to pass overhead, and were sometimes heavy enough to block the sun and darken the skies (Ibid.). They also nested in very large concentrations, and the babies, or squabs, quickly became fat. Because of their high fat content and inability to fly, squabs were an excellent and easy to obtain food source. Once the squabs could fly, their body fat would virtually disappear in about a week. Outside of the spring roost passenger pigeons are difficult to catch, as they are more dispersed, travel in forests, and are very fast and agile. They may, however, aggregate at feeding locations during the day. Adults may be taken on the fall migration, when they again gather in large groups, but they only stop at a rest spot for one night before continuing south.

Passenger pigeons would have appeared in the Northeast at a time of the year when hunter-gatherers would have been running out of stored food. By early spring deer are in very poor condition and no longer congregate in yards. Other sources of animal or plant food would be scarce. Therefore, in the early spring pigeons would have been the highest ranked food source available, with the high fat content of the squabs making them all the more attractive. Because they gathered in very large roosts, pigeons would have attracted large numbers of human hunters (and other predators). It was essential that hunter-gatherers find the roost quickly, because the window of opportunity for obtaining squabs was so small. A large roost of nesting pigeons and their squabs provided more food than a single group could possibly use, so hunter-gatherers likely shared information about where the pigeons were nesting with other groups. Such cooperation may have been repaid in future years, when pigeons roosted in other locations.

An attempt by a group, or by individuals within a group, to restrict access to a passenger pigeon roost was unlikely to be successful because pigeons would not use the same area every year. Pigeons were highly reliant on beech nuts and other mast, or nut, crops to feed themselves and their squabs. These nut-bearing trees do not produce a large mast crop every year. Beech, for example, tends to produce large crops every two years or so. In years when only an average crop was produced, all or most nuts in that location would be eaten by other animals (and humans) before the pigeons arrived in the spring. It is only in the years of bumper crops would enough nuts survive to the spring to support the large pigeon flocks. In addition, sometimes the dense aggregations of pigeons could do such damage to the trees themselves (by breaking tree limbs and depositing layers of excrement) that an area used as a roost was unlikely to be suitable to be used again for several years. The location of spring pigeon roosts, and their size, therefore would vary year to year depending upon where beech or other mast crops were available.

Conclusion

Animal remains support Ritchie's contention that Lamoka Lake was occupied year-round. The Cole Gravel Pit site also appears to have been occupied for multiple seasons. Many of the characteristics of Late Archaic subsistence in central New York can be explained by the specific behavioral and community ecology of the prey species these people exploited. Hunter-gatherers appear to have preferentially exploited high-ranked prey, especially white-tailed deer and passenger pigeon, as they became available. These prey were also seasonally abundant, and it appears likely that diet breadth was constricted during these times, possibly widening during summer to include more lower-ranked taxa.

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