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ARCHAEOLOGICAL TURTLE BONE REMAINS FROM CONCORD SHELL HEAP

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Archaeological turtle bone remains from the Concord Shell Heap site constitute a total of 599 fragments contained in the collections of Jeffries Wyman (1867) and Benjamin Smith (1925-1946). The former of these is a small collection of 25 bone fragments, all well preserved and easily identifiable to species. The latter collection amassed by Smith is much larger, comprising 574 fragments, and consisting of a larger variety of pieces, many very small and fragmentary, others large and readily identified. Preliminary results of the identifications of turtle species in the Smith collection have previously been published by Rhodin and Largy (1984) and Rhodin (1986, 1992).

The Wyman collection of 25 bone fragments was 100% identifiable to three species of turtles: stinkpot turtle, *Sternotherus odoratus*, 14 fragments; painted turtle, *Chrysemys picta*, 10 fragments; and redbelly turtle, *Pseudemys rubriventris*, 1 fragment.

The Smith collection of 574 bone fragments yielded 348 (60.6%) identifiable fragments, representing eight different species of turtles: stinkpot turtle, 60 fragments; painted turtle, 119 fragments; redbelly turtle, 68 fragments; snapping turtle, *Chelydra serpentina*, 23 fragments; wood turtle, *Clemmys insculpta*, 11 fragments; Blanding's turtle, *Emydoidea blandingii*, 11 fragments; box turtle, *Terrapene carolina*, 46 fragments; and spotted turtle, *Clemmys guttata*, 10 fragments.

No significant differences are apparent between the two collections regarding provenience from within the Concord Shell Heap site, so all further discussion and analysis of turtle bone remains will combine the data from the two collections and treat the data set as a single entity.

Analyzing the collection as a whole, there are 599 fragments of turtle bone, of which 373 (62.3%) are identifiable to species. The total mass of turtle bones is 327.5 g, of which 276.3 g (84.4%) is identifiable to species. The higher percentage of mass identified reflects the fact that the small and fragmentary pieces were not as easily identifiable as the larger, heavier pieces.

Turtle Species Present

The eight species of turtles recorded from Concord Shell Heap compose essentially the entire present freshwater and terrestrial turtle fauna of eastern New England. Only three other species could possibly be peripherally included: the estuarine diamondback terrapin (*Malaclemys terrapin*) which is presently confined to a few isolated localities on Cape Cod and the Connecticut shore, the freshwater bog turtle (*Clemmys muhlenbergii*) which is extremely rare and exists only in a few small disjunct populations in extreme western Massachusetts and Connecticut, and the eastern mud turtle (*Kinosternon subrubrum*), which reaches the northern limit of its present-day range in the greater New York City area, possibly including extreme southwestern Connecticut.

In terms of number of fragments, the most common turtle species found at Concord Shell Heap is the painted turtle (*Chrysemys*

picta), represented by 129 fragments (34.6% of the total). The painted turtle is a small aquatic species averaging 5 to 7 inches (13-18 cm) in carapace length. It is an abundant, highly gregarious species, often seen basking in great numbers on logs and rocks, and is easily the most conspicuous member of the New England turtle fauna. In Massachusetts, it is active from about April to October, and does not estivate during the warm summer months.

The second most common species in terms of number of fragments found is the musk turtle (*Sternotherus odoratus*), represented by 74 fragments (19.8%). This is a common, very small aquatic species, averaging 3 to 4 inches (8-10 cm) in carapace length. It is the smallest turtle found at Concord, with very little edible meat. It is also known as the stinkpot turtle and exudes an extremely foul smelling musk when handled. It is active from about April to October and is most easily encountered in marshes or shallow still bodies of water with extensive aquatic vegetation.

The third most common turtle species (in terms of number of fragments) is the redbelly turtle (*Pseudemys rubriventris*), represented by 69 fragments (18.5%). The redbelly was the second largest turtle available to the local inhabitants, reaching a carapace length of 10 to 12 inches (25-30 cm). Like the smaller painted turtle, it is a conspicuous basker and also active from about April to October. It is good to eat, and as recently as the turn of the century was commonly sold in food markets in the Chesapeake Bay region and Washington D.C. A sample of redbelly bone from the site used for radiocarbon dating yielded a δ^{13}C-corrected age of 4,660 $\pm$ 70 ^{14}C years B.P. Deer bone from the site gave a δ^{13}C-corrected age of 4,410 $\pm$ 70 ^{14}C years B.P. (Blancke 1995).

The fourth most common species of turtle at Concord is the box turtle (*Terrapene carolina*), represented by 46 fragments (12.3 %). In Massachusetts, this species occurs at the extreme northern limit of its range. It is a moderately common, though solitary, small terrestrial species, averaging 4 to 6 inches (10-15 cm) in carapace length. It typically occupies woodlands and fields, but can also be found in marshes and swamps. It tends to emerge from terrestrial hibernation somewhat late in the spring, usually after painted turtles in April, and often partially estivates during hot periods in the summer.

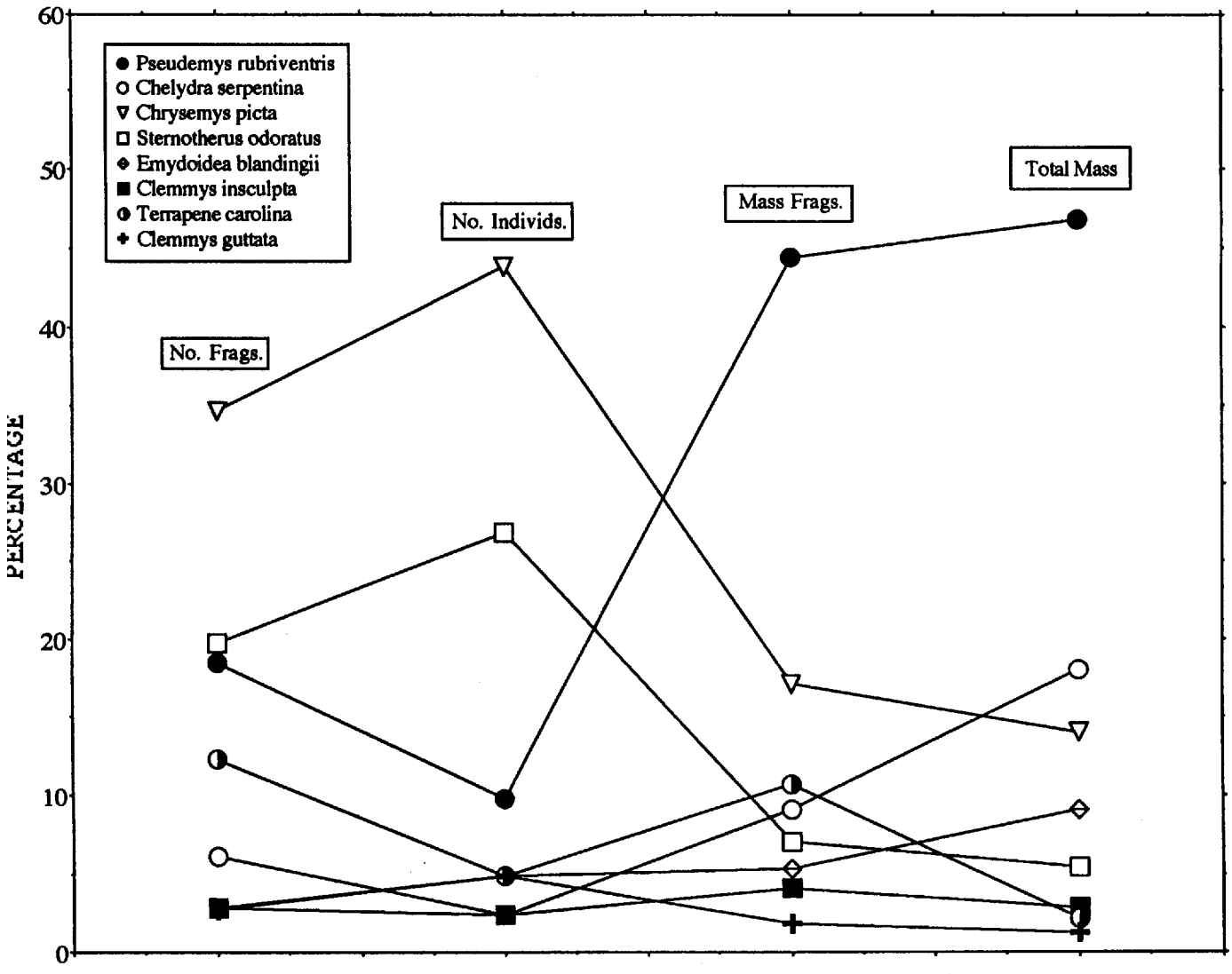
The fifth most common turtle species is the snapping turtle (*Chelydra serpentina*), represented by 23 fragments (6.2%). Of the turtle species recorded at Concord, it is the largest, with individuals reaching 12 to 15 inches (30-38 cm) in carapace length. It is a highly aquatic species which does not bask, but can often be found close to shore in mud shallows. It is active from April to October, and is often found wandering on land during nesting season in June. Large individuals can weigh from 30 to 50 pounds (14-23 kg) and yield a good quantity of delicious meat. Commercial exploitation of snappers for meat and soup still occurs in our society today.

The sixth and seventh most common turtle species found at Concord are the Blanding's turtle (*Emydoidea blandingii*) and the wood turtle (*Clemmys insculpta*), represented by 11 fragments each (2.9% each). Blanding's turtle is a locally abundant but highly disjunct species occurring in only a few localities in eastern New England. It is a medium to relatively large semi-aquatic species, averaging about 8 to 10 inches (20-25 cm) in carapace length, often found basking singly or in small groups. Both males and females may spend considerable time on land during spring and nesting season. The wood turtle is a moderately common, solitary, medium sized terrestrial species, averaging about 6 to 8 inches (15-20 cm) in carapace length. Its habitat is similar to

Table 1. Turtle Bone Measurements.

	Number of Fragments		Mass of Fragments		Min. No. Individuals		Avg.Mass Individual	Approximate Total Mass	
Species	No.	%	gms.	%	No.	%	gms.	gms.	%
Pseudemys rubriventris	69	**18.5**	122.9	**44.5**	4	**9.8**	3,418	13,672	**46.9**
Chelydra serpentina	23	**6.2**	25.2	**9.1**	1	**2.4**	5,250	5,250	**18.0**
Chrysemys picta	129	**34.6**	47.5	**17.2**	18	**43.9**	228	4,104	**14.1**
Emydoidea blandingii	11	**2.9**	15.0	**5.4**	2	**4.9**	1,326	2,652	**9.1**
Sternotherus odoratus	74	**19.8**	19.5	**7.1**	11	**26.8**	145	1,595	**5.5**
Clemmys insculpta	11	**2.9**	11.3	**4.1**	1	**2.4**	845	845	**2.9**
Terrapene carolina	46	**12.3**	29.8	**10.8**	2	**4.9**	323	646	**2.2**
Clemmys guttata	10	**2.7**	5.1	**1.8**	2	**4.9**	189	378	**1.3**
TOTALS IDENTIFIED	373	**62.3**	276.3	**84.4**	41			29,142	
UNIDENTIFIED	226	**37.7**	51.2	**15.6**					
OVERALL TOTALS	599		327.5						

Figure 1. Types of Analysis.



the box turtle, except that it hibernates in streams, and is active somewhat earlier, from about March to October.

The least common turtle species is the spotted turtle (*Clemmys guttata*), represented by 10 fragments (2.7%). The spotted turtle is a small aquatic species, averaging 4 to 5 inches (10-13 cm) in carapace length. Though now somewhat uncommon and localized, it was historically a relatively common and often locally abundant turtle, usually found in cranberry bogs and other shallow ponds and marshes with extensive vegetation. In Massachusetts, it is active from about March to October, usually with a period of relative estivation during the warmest summer months. It emerges from hibernation earlier in the spring than the painted turtle, and is often replaced by the painted turtle in the same microhabitat during late spring and early summer as the temperatures rise.

Chelonian Faunal Analysis

In terms of the percentage composition of the turtle species present in this faunal material, analysis has been carried out in four different ways:

1. Number of fragments of each species as a percentage of the total number of identifiable turtle fragments.
2. Mass of fragments of each species as a percentage of the total mass of the identifiable turtle fragments.
3. Minimum number of individuals of each species as a percentage of the total minimum number of turtles.
4. Total mass of each species as a percentage of the total mass of all turtles, based on the minimum number of individuals and average mass of each of the individual species.

The results of these four types of analysis are presented in Table I and Figure 1. In terms of percentage of number of fragments present, the painted turtle (*Chrysemys picta*) is the most common (34.6%), the musk turtle (*Sternotherus odoratus*) second most common (19.8%), and the redbelly turtle (*Pseudemys rubriventris*) third most common (18.5%). The same three species are also the most common when analyzed as a percentage of minimum number of individuals (43.9%, 26.8%, and 9.8% respectively). However, when examining percentage of mass of fragments present, the redbelly turtle is the most common (44.5%), the painted turtle second most common (17.2 %), and the box turtle (*Terrapene carolina*) third most common (10.8%). In addition, when one looks at total mass based on minimum numbers of individuals and their average mass, the redbelly is once again the most common species (46.9%) with the snapping turtle (*Chelydra serpentina*) second most common (18.0%), and painted turtles third most common (14.1%).

The apparent percentage compositions of the turtle fauna differ markedly depending on the type of analysis performed. These differences are at least partially directly and predictably affected by the taphonomic differences in bone preservation due to differences in body mass and bone biodegradability of the various turtle species preserved in the faunal collection. Large bones from large turtles are more likely to be well-preserved, found, and identified, than smaller bones from smaller turtles. Also, thick dense bones are more readily preserved than thin porous ones, and the relative abundance of each type of bone within each turtle species helps determine how likely one is to find preserved bones of that particular species.

Snapping turtles are large animals and even a single specimen can supply a large amount of delicious food. One might therefore

logically expect to find a high percentage of snapper bones in the faunal collection. However, a large percentage of their bones are extremely thin and porous and thereby easily biodegradable over time. Therefore, resultant fragment counts and actual mass of bones preserved from snapping turtles probably significantly underestimate their actual prominence and importance in the overall subsistence diet. Redbelly turtles are also relatively large animals, but with a high percentage of very thick, dense, and durable bone. Fragment counts and mass of bones preserved from redbelly turtles may therefore actually overestimate their relative abundance in the diet. Blanding's and wood turtles are a bit smaller than redbellies with similarly dense but thinner bone. Painted, box, and spotted turtles are much smaller animals, also with thin but relatively easily preserved bone. Musk turtles are the smallest of all, with a somewhat reduced smaller bony shell, but no appreciable difference in bone quality from painteds or spotteds.

If one then adds a "corrective taphonomic factor" for bone preservability to the analysis of the relative percentage of turtle species utilized at Concord Shell Heap, one would predict that snapping turtles were relatively more common than the record accounts for, and that redbellies were relatively less common. Overall, in terms of the total mass of turtle species utilized for the subsistence diet, it appears probable that snapping and redbelly turtles probably constituted more or less equal major components of the turtle diet, with painted turtles next most common, followed by all the other less prevalent species. Of note is that musk turtles were evidently collected in relatively large numbers, but because of their very small size did not contribute much to the total mass of turtles in the diet.

Chelonian Zooarchaeology

A chelonian zooarchaeological analysis of the turtle fauna recorded at Concord Shell Heap can now be performed in comparison with other New England midden finds where the chelonian material has been sufficient to yield significant results. The sites compared are: 1) Concord Shell Heap, Concord, Massachusetts, identifications of turtle bone by Rhodin (present study); 2) Flagg Swamp Rockshelter, Marlboro, Massachusetts, identifications of turtle bone by Huntington and Shaw (1982); 3) Cedar Swamp, Westborough, Massachusetts, identifications by Rhodin (1986, 1992); 4) Sewall's Falls, Concord, New Hampshire, identifications by Rhodin, preliminary findings published by Howe (1988); 5) Olsen site, Cushing, Maine, identifications by Rhodin, preliminary findings reported by Downs (1987), site described by Spiess and Eldridge (1985); and 6) Ellis Island, Hudson River mouth, New Jersey, identifications by Rhodin, site described by Pousson (1986:253). Four of these sites are within the Merrimack River drainage basin, three in the Concord River drainage. One site is from northeastern coastal Maine, one site from extreme southwestern New England in the New York region. These sites are recorded on the map in Figure 2 and the chelonian zooarchaeological analysis in Table II and Figure 3. Portions of this analysis have previously been published by Rhodin (1992).

Of particular note in comparing the six turtle assemblages are the relative percentages of painted (*Chrysemys picta*) vs. spotted (*Clemmys guttata*) turtles. Because of the habits of these two species, it sometimes becomes possible to infer patterns of seasonal site usage based on their relative frequencies in New England prehistoric faunal assemblages. Within a given natural habitat where the two species are locally microsympatric (i.e. occur together), spotted

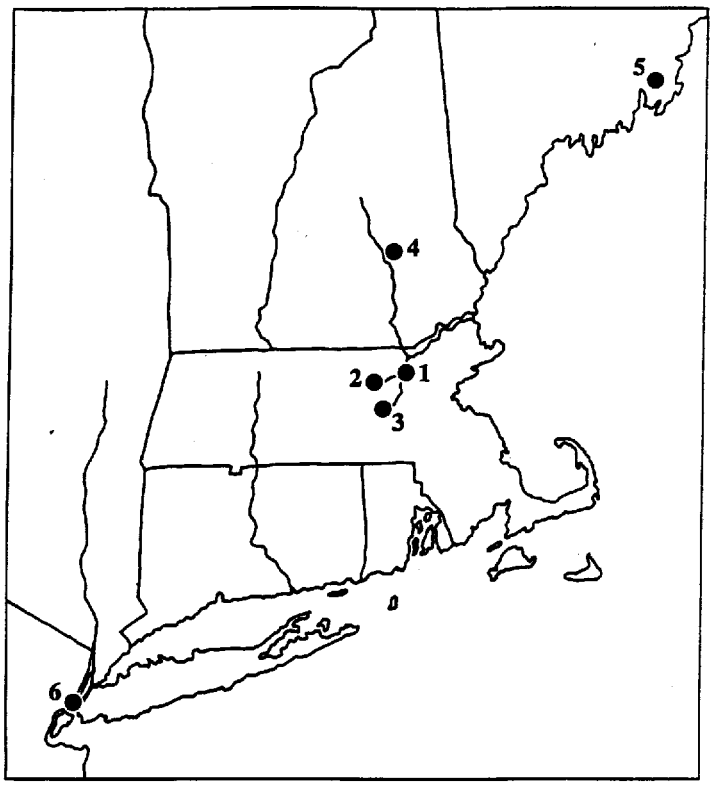


Figure 2. Sites mentioned: (1) Concord Shell Heap; (2) Flagg Swamp; (3) Cedar Swamp; (4) Sewall's Falls; (5) Olsen Site; (6) Ellis Island.

turtles are extremely common and easily captured in the early spring from about March to about May, and then become increasingly difficult to locate as they begin to estivate or become more cryptically active under the vegetation during the warmer summer months. During the same time intervals, painted turtles are relatively scarce in the early spring months and then become increasingly common as the weather warms and remain active and conspicuous during the summer. By comparing the percentages of painted vs. spotted turtles in an assemblage it may be possible to predict whether the site was utilized primarily in the early spring or in mid-summer.

For example, the Flagg Swamp Rockshelter in Marlboro was a winter habitation site subsequently abandoned for the summer (Huntington 1982). Of the turtle fragments identified by Huntington and Shaw (1982), 74% represent spotteds and only 20% painteds. This supports the conclusion that Flagg Swamp was a winter site where the inhabitants probably began collecting spotted turtles in the early spring as soon as they began to emerge in March, but probably stopped collecting and moved to a summer habitation site before painted turtles became more common in the later spring months.

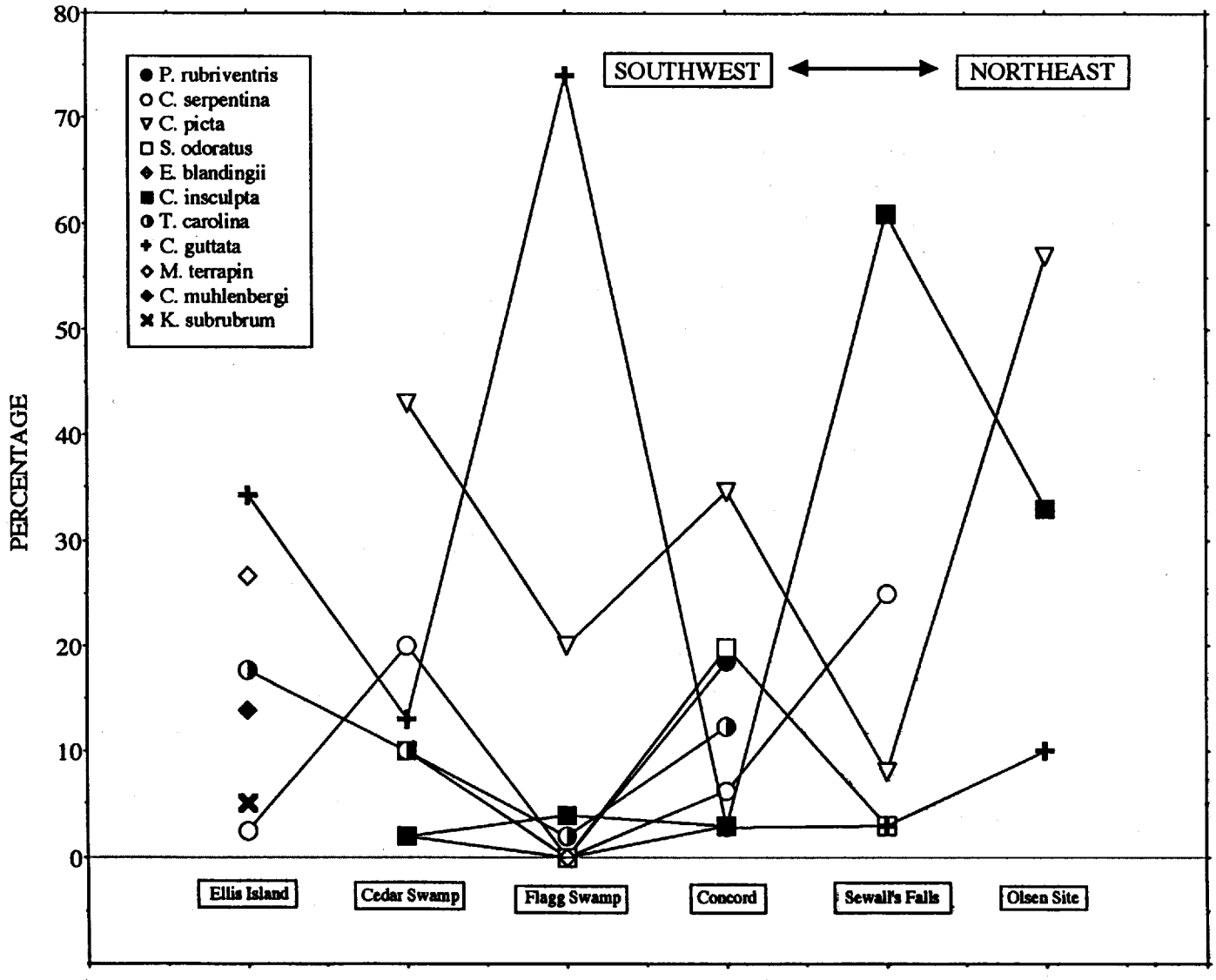
In contrast, the Concord Shell Heap site has 35% painted turtles and only 3% spotted. This suggests that the site was primarily a summer habitation, not occupied until the late spring when the weather was warm enough to cause most of the spotted turtles to disappear into partial estivation. Alternatively, it is possible that the site was also used in the early spring, but that no suitable spotted turtle habitat was found in the area. This hypothesis would appear less likely since spotted turtles are presently relatively common in the general Concord area.

The percentages of painteds vs. spotteds for Cedar Swamp are intermediate between those for Flagg Swamp and Concord Shell Heap. Painted turtles accounted for 43% and spotted turtles 13%. This may suggest that the site was neither exclusively a winter to early spring habitation nor strictly a summer site. Instead, the percentages support the probability that Cedar Swamp was an all-year habitation, where spotted turtles were collected in the early spring months and then primarily painted turtles in the later spring and summer months. Two spotted turtle plastral fragments with visible growth zones support the supposition that spotted turtles were being collected at the site during the early spring months (Rhodin 1986).

Table 2. Chelonian Zooarchaeological Analysis of Six Sites in the Northeast.

	Common	Ellis Island		Cedar Swamp		Flagg Swamp		Concord		Sewall's Falls		Olsen Site	
SPECIES	Name	n	%	n	%	n	%	n	%	n	%	n	%
Pseudemys rubriventris	redbelly	0	0.0	1	2.5	0	0.0	69	18.5	0	0.0	0	0.0
Chelydra serpentina	snapper	2	2.5	8	20.0	0	0.0	23	6.2	9	25.0	0	0.0
Chrysemys picta	painted	0	0.0	17	42.5	10	20.4	129	34.6	3	8.3	12	57.1
Sternotherus odoratus	musk	0	0.0	4	10.0	0	0.0	74	19.8	1	2.8	0	0.0
Emydoidea blandingii	Blanding's	0	0.0	0	0.0	0	0.0	11	2.9	0	0.0	0	0.0
Clemmys insculpta	wood	0	0.0	1	2.5	2	4.1	11	2.9	22	61.1	7	33.3
Terrapene carolina	box	14	17.7	4	10.0	1	2.0	46	12.3	0	0.0	0	0.0
Clemmys guttata	spotted	27	34.2	5	12.5	36	73.5	10	2.7	1	2.8	2	9.5
Malaclemys terrapin	diamondback	21	26.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Clemmys muhlenbergii	bog	11	13.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Kinosternon subrubrum	mud	4	5.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
TOTALS		79		40		49		373		36		21	

Figure 2. Chelonian Zooarchaeological Analysis.



The high percentage of painted turtles suggests the probability that the site was also being actively used during the summer months. These findings support Warfield's (1986) conclusion that Cedar Swamp was a relatively permanent habitation, where the inhabitants had created a structured site with a complete social group subsisting on a wide local resource base.

The extremely low percentages of either painted or spotted turtles at Sewall's Falls site in New Hampshire suggest a local scarcity of these species. The correspondingly high percentage of wood (*Clemmys insculpta*) and snapping turtles (*Chelydra serpentina*), more cold-tolerant than either painteds or spotteds, suggest that Sewall's Falls site was inhabited during a period of time when the climate there was colder than it is now. The percentages of turtles in the prehistoric fauna are more similar to some areas of present-day Canada such as northern Nova Scotia, where wood and snapping turtles are abundant, but painted turtles uncommon and spotted turtles absent. The present-day turtle fauna of the general Sewall's Falls area resembles that of prehistoric Concord Shell Heap or Cedar Swamp (with the exception of redbelly and box turtles which are not known to occur in New Hampshire).

The percentages of painteds and spotteds at Olsen site in Maine suggest an all-year habitation at about the northern limit of the range for spotted turtles, where painteds constitute the majority of the relatively depauperate turtle fauna, but spotteds were collected when available, and the cold-tolerant wood turtle was relatively abundant. The absence of snapping turtle bone from Olsen site is surprising, but may simply reflect the relatively small size of the sample available for analysis or possibly taphonomic factors such as accelerated degradation of porous snapping turtle bones in the more humid coastal environment. However, other coastal sites in south-central Maine have yielded snapping turtle bone (e.g. Basin site in Phippsburg; Waters 1965).

Both Sewall's Falls and Olsen sites are located north of the northern range limit of redbelly and box turtles, so their absence in those faunas is not surprising, and the distribution of Blanding's turtles is extremely disjunct, so their absence from those sites is not unexpected. Box turtles (*Terrapene carolina*) were only common at the three summer or all-year habitation sites within the current range of the species--Concord, Cedar Swamp, and Ellis Island, and relatively uncommon at the winter site, Flagg Swamp. Wood turtles (*Clemmys insculpta*) were only common at the two northern colder climate sites, Sewall's Falls and Olsen site, less common at the southern warmer weather sites, Concord, Flagg Swamp, and Cedar Swamp, and absent at the more southern Ellis Island site. Musk turtles (*Sternotherus odoratus*), though foul smelling and very small, were obviously utilized by prehistoric man, being found at three of the six sites, and present in large numbers at Concord Shell Heap. Their use in the diet of prehistoric man has also previously been noted by Adler (1968), with possible medicinal or ceremonial use being hypothesized by Hoffmann (1990).

The most southern site, Ellis Island, is distinct in several ways. First, it is a coastal site where the inhabitants made extensive use of the high biological productivity of the estuarine environment of the Hudson River mouth. Large numbers of diamondback terrapins (*Malaclemys terrapin*) were collected, constituting 26.6% of the number of fragments identified. This species is exclusively estuarine in its habitat, and abundant along the New Jersey shore. It is considered a delicacy and early in this century supported a large gourmet food industry. Also very common at the Ellis Island site was the spotted turtle, comprising 34.2% of the identified fragments. Interestingly, no

painted turtle fragments were found at all, so no inferences of seasonality can be made from spotted vs. painted relative abundance. More likely, these spotteds were collected from a locally abundant population of spotteds from coastal bogs and swamps where there were no painteds present. Also collected from the same swamps were a few specimens of bog turtles (*Clemmys muhlenbergii* - 13.9% of the total), which often share their habitat with spotted turtles. The bog turtle is today extremely rare, but has been collected in modern times on Staten Island, and in the general area of New York City. This record from Ellis Island constitutes the first archaeological record of the species. Also present in the faunal material were a few fragments of mud turtle (*Kinosternon subrubrum*), constituting 5.1% of the total. Ellis Island is at the extreme northern limit of the range of this southern species. In addition, large numbers of box turtle (17.7%) and a few snappers (2.5%) round out the turtle fauna utilized on Ellis Island.

The redbelly turtle (*Pseudemys rubriventris*) is an interesting species that has a disjunct modern distribution and is currently extremely rare and restricted in New England. During the last interglacial period it was probably contiguously distributed all along the emergent continental shelf from North Carolina to New Hampshire. The New England population of the species now appears to survive only in one small area of Plymouth County of Massachusetts. This population is now isolated, endangered, and protected. Until recently, it was felt to represent a distinct subspecies, *Pseudemys rubriventris bangsi*, but recent morphological investigations have failed to differentiate it from the southern populations of what used to be the nominate subspecies, which is currently distributed along the coastal Chesapeake Bay region from southern New Jersey to northeastern North Carolina. A recovery plan for saving the remaining Massachusetts populations is currently in effect (U.S. Fish and Wildlife Service, 1985), and knowledge gained through archaeological studies is helping to understand the redbelly's former range and to formulate a conservation policy based on documented former localities.

The former New England distribution of the redbelly turtle was greater than it is now, with midden specimens having been found at several Massachusetts sites where living populations no longer occur: Ipswich (Bullen 1949), Martha's Vineyard (Waters 1962, 1966), Concord (Rhodin and Largy 1984), Westborough and Wayland (Rhodin 1992). The finds of redbelly turtle in the latter three localities confirm the former widespread distribution of the species in the southern extent of the Merrimack River drainage basin, especially in the Concord and Sudbury drainages. Our data confirms the presence of redbelly turtles at Concord at 4,660 $\pm$ 70 ^{14}C years B.P. The evidence suggests at least partial extirpation of the redbelly turtle at the hand of prehistoric man. Certainly it formed a very significant part of the subsistence diet at the Concord Shell Heap site. A similar pattern of human-induced local prehistoric extinction has been documented for box turtles in northern New York state (Adler 1970). Other archaeological redbelly turtle remains have also been recorded from the lower Hudson River at Croton Point, New York (Parris 1987), where the species no longer occurs. This redbelly material was found in a midden stratum dated at 5,850 $\pm$ 200 ^{14}C years B.P., and serves as another datapoint demonstrating the previous contiguous distribution of this species along the emergent continental shelf between southern New Jersey and eastern Massachusetts.

As part of the chelonian zooarchaeological analysis, comparison was also made between the Concord Shell Heap site and a

Table 3. Analysis of Newbridge Site (Styles 1981).

Newbridge-Carlin-Apple Creek, Illinois, Sites Totals (Styles, 1981)								
		Number of		Min. No.		Avg.Mass	Approximate	
	Common	Fragments		Individuals		Individual	Total Mass	
Species	Name	No.	%	No.	%	gms.	gms.	%
Chelydra serpentina	snapper	26	**8.3**	7	**15.2**	5,250	36,750	**63.3**
Trionyx spiniferus	softshell	10	**3.2**	4	**8.7**	1,790	7,160	**12.3**
Trachemys scripta	slider	48	**15.4**	6	**13.0**	1,150	6,900	**11.9**
Trionyx muticus	softshell	3	**1.0**	2	**4.3**	1,790	3,580	**6.2**
Terrapene ornata	ornate box	163	**52.2**	11	**23.9**	323	3,553	**6.1**
Terrapene carolina	box	6	**1.9**	5	**10.9**	323	1,615	**2.8**
Chrysemys picta	painted	12	**3.8**	6	**13.0**	228	1,368	**2.4**
Sternotherus odoratus	musk	21	**6.7**	4	**8.7**	145	580	**1.0**
Kinosternon flavescens	mud	23	**7.4**	1	**2.2**	145	145	**0.2**
TOTALS		312		46			58,071	

comparably large and well-analyzed collection of chelonian faunal remains from the lower Illinois valley, specifically, the turtles identified by Styles (1981) in her three closely geographically proximate sites Newbridge, Carlin, and Apple Creek. Styles identified 312 fragments to species level and was able to calculate minimum numbers of individuals based not only on repetitive elements, but also on their presence in discrete episodes of her analysis. For the purposes of the present comparison, her results have been summarized and added together for the three separate sites (see Table 3) and are hereafter referred to solely as the Newbridge site. The type of analysis now performed on her combined data is comparable to that performed for the Concord Shell Heap, with the exception that analysis based on mass of the fragments could not be carried out.

Of note in comparing the two turtle faunal assemblages is that each is of about the same diversity, with eight species recorded at Concord and nine at Newbridge. Only four of those species are present in both locations (snappers, painteds, box, and musk turtles). In terms of the numbers of fragments, the most common species at Newbridge was the ornate box turtle (*Terrapene ornata* - 52.2%), with the slider turtle (*Trachemys scripta* - 15.4%) second most common, and the snapper third (8.3%). However, when one takes into account the minimum numbers of individuals and calculates out the approximate total mass of each species available for the subsistence diet, the snapper becomes by far the most common species, with fully 63.3% of the identified chelonian fauna. The reason for this has been elucidated earlier, due to the taphonomic factors of the biodegradability of snapping turtle bone. In terms of resource utilization, it certainly makes sense and would be expected that the site inhabitants would tend to use the largest turtle species relatively more than the smaller species, at least in terms of overall meat consumption. Styles' data and our calculated numbers bear this out, not only for the largest snapping turtles, but also for the other large species. The second largest turtle in the area is the spiny softshell (*Trionyx spiniferus*) and it is also the second most common species at 12.3%; fourth place in body size and third place in approximate total mass goes to the slider (*Trachemys scripta* - 11.9 %); third place for body size and fourth place for total mass percentage goes to the smooth softshell (*Trionyx muticus* - 6.2%); and so on down the line, with the smallest turtle

contributing the least to the approximate total mass (*Kinosternon flavescens* [mud turtle] - 0.2%). In comparing this pattern to the one present in Concord, one notes that the painted turtle is utilized at Concord to a far greater extent than one would predict based on its body size. Despite being relatively small, it was evidently sought out and constitutes a relatively high percentage of the diet. Similarly, the very small musk turtle was actively collected at Concord in numbers that raise its relative significance in the diet beyond what one would expect based on size alone.

Based on the analysis of the turtle material present at Concord Shell Heap, and the comparative analysis of the other sites mentioned, we conclude that this site was primarily a summer habitation. The relatively high percentages of small turtles in the diet suggest a need by the local inhabitants to stretch their available resources to the greatest extent possible. The presence in their diet of all locally available turtle species underscores their utilization of their entire resource base to its fullest.

In conclusion, analysis of the chelonian zooarchaeology of a prehistoric site can augment our understanding of the resource utilization patterns of its inhabitants, the climate and seasonality of the habitation, and the historical distribution and population trends of the turtle species encountered. Concord Shell Heap and the other sites examined in this paper confirm the value of this type of faunal analysis.

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Note added in proof:

At the last moment, 3 overlooked turtle bones from the Benjamin Smith collection were located in the Thoreau Lyceum. These bones weigh a total of 0.9 g and are all terminal phalanges of a snapping turtle (*Chelydra serpentina*). Taking these bones into consideration brings the total number of turtle bones from Concord Shell Heap to 602, of which 376 (62.5%) are identifiable to species. The total mass of turtle bones is now 328.4 g, of which 277.2 g (84.4%) is identifiable to species. The total number of snapping turtle fragments is now 26 (6.9% of the identified total), weighing 26.1 g (9.4%).