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CHELONIAN ZOOARCHAEOLOGY OF EASTERN NEW ENGLAND: TURTLE BONE REMAINS FROM CEDAR SWAMP AND OTHER PREHISTORIC SITES

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Turtles have been used by man for a long time. Primitive tribes around the world have often based a large proportion of their resource utilization on local turtle populations. In South America, the large riverine species *Podocnemis expansa* was so heavily exploited that early Amazonian explorers estimated that literally millions of adult turtles and their eggs were harvested and consumed by the natives every year. Modern Amazonian tribes continue to use the same turtle resources, but by now they have dwindled to mere fractions of their former abundance.

The use of turtles as a food resource was also widely practiced by prehistoric man in New England. Though never reaching the same degree of utilization as in the tropics, turtles were nonetheless an important component of the local subsistence diet. At the Cedar Swamp sites, turtle bone remains constitute approximately 23% of the salvaged faunal material (Warfield 1986).

Cedar Swamp Sites.

The Cedar Swamp sites at Westborough, Massachusetts have yielded a total of 260 fragments of turtle bone. Of these, 223 are from the Cedar Swamp-3 site, 1 from Cedar Swamp-2, and 36 from Cedar Swamp-4. Nearly all the fragments are calcined bone less than 1.0 cm in size, with most being less than 0.5 cm. Of the 260 fragments, only 40 (15.4%) are identifiable to species (see Table I). This low percentage is due to the small and fragmentary nature of the material. Preliminary analysis of much of this material has previously been published (Rhodin 1986).

Of the 260 turtle fragments recovered, 165 (63.4%) are from two single Cedar Swamp-3 features (# 6 and # 12) interpreted as shallow red earth middens (Warfield 1986). Feature # 6 has been radiocarbon dated at 970 ± 70 B.P. (Beta 15195; Hoffman 1988). Much of the other bone recovered has also been found associated with midden features. Of the 198 fragments recovered from identifiable features, 94.9% are from shallow red earth middens, and only 5.1% from deep red earth storage pits.

The 40 identifiable fragments of turtle bone from the Cedar Swamp sites represent seven different species of turtles: painted turtle, *Chrysemys picta*; snapping turtle, *Chelydra serpentina*; spotted turtle, *Clemmys guttata*; box turtle, *Terrapene carolina*; musk turtle, *Sternotherus odoratus*; wood turtle, *Clemmys insculpta*; and redbelly turtle, *Pseudemys rubriventris*.

The most common turtle species found at the Cedar Swamp sites is the painted turtle (*Chrysemys picta*), represented by 17 fragments (43% 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

Table I. Identified turtle bone fragments from Cedar Swamp sites.

Species	Feature	Quadrant	Element
Chrysemys picta (painted)	CS3	S119W0	plastron margin
	"	S89W49	left hyoplastron
	CS3-4	S100W19-B	costal
	CS3-6	S107W29-B2	right hypoplastron
	"	"	marginal
	"	"	left epiplastron
	"	S107W30-A3	marginal
	"	S107W30-B2	costal
	"	"	seventh neural
	"	"	marginal
	"	"	right epiplastron
	"	"	marginal
	CS3-12	S98E11	xiphiplastron
	CS3-15	S69W20-B2	entoplastron
	CS4	S143W164-A3	marginal
	"	"	marginal
	"	S139W169-A3	marginal
Chelydra serpentina (snapper)	CS3	Surface	marginal
	"	"	marginal
	CS3-4	S100W19-B	left maxilla
	"	"	left postorbital
	CS3-12	S99E11-B2	marginal
	"	"	scapula
	CS3-15	S69W20-B2	costal
	"	S69W20-A3	costal
Clemmys guttata (spotted)	CS2	Surface	hypoplastron
	CS3-5/9	S99W29-B2	left hypoplastron
	CS3-6	S107W30-A3	left third marginal
	CS3-12	S99E11-B2	right first costal
	"	"	right seventh marginal
Terrapene carolina (box)	CS3-6	S107W29-B2	left second costal
	CS3-12	S98E11	xiphiplastron
	"	S99E11-B2	epiplastron
	CS4	S139W169-B2	nuchal
Sternotherus odoratus (musk)	CS3-6	S107W29-B2	right seventh marginal
	"	S107W30-B2	right second marginal
	CS3-12	S99E11-B2	right fifth costal
	CS4	S143W169-A3	marginal
Clemmys insculpta (wood)	CS4	Surface	left hypoplastron
Pseudemys rubriventris (redbelly)	CS4	S139W169-A3	plastron fragment

summer months.

The second most common turtle species is the snapping turtle (*Chelydra serpentina*), represented by 8 fragments (20%). Of the turtle species recorded at Cedar Swamp, 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 (13-23 kg) and yield a good quantity of delicious meat. Commercial exploitation of snappers for meat and soup still occurs in our society today.

The third most common turtle species is the spotted turtle (*Clemmys guttata*), represented by 5 fragments (13%). 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 habitat during late spring and early summer as the temperatures rise. Of the 5 fragments of spotted turtle bone found, two demonstrate signs of seasonality. Both are plastral fragments showing four distinct peripheral growth zones. Of these four growth zones, the most recent one is ca. 1.5 to 2 times as wide as any of the preceding ones. This means that the turtle had grown more rapidly in its most recent growing season and also that the animal had probably been caught at the very end of this very active growing season. This can mean that it was either caught late in the fall just before hibernation or early in the spring, just before starting a new growth zone. It is unlikely that it was captured in the middle of the summer, as one would then expect to see an incomplete growth zone of a much lesser width. Due to the fact that spotted turtles are most easily captured in the early spring when they emerge from hibernation, and less apt to be found in the fall as they settle into hibernation, it appears likely that these animals were captured in about March or April.

The next most common species of turtle at Cedar Swamp is the box turtle (*Terrapene carolina*), represented by 4 fragments (10%). 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.

As common as the box turtle is the musk turtle (*Sternotherus odoratus*), also represented by 4 fragments (10%). This is a common, very small aquatic species, averaging 3 to 4 inches (7-10 cm) in carapace length. It is the smallest turtle found at Cedar Swamp, 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 next turtle species found at Cedar Swamp is the wood turtle (*Clemmys insculpta*), represented by one fragment (2%). 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 the box turtle, except that it hibernates in streams, and it is active somewhat earlier, from about March to October.

The last turtle species found at Cedar Swamp is the redbelly turtle (*Pseudemys rubriventris*), also represented by a single fragment (2%). The presence of this species in the Cedar Swamp turtle fauna was not recorded in the earlier report on this material (Rhodin 1986). The single fragment was found at Cedar Swamp-4 in quadrant S139W169, level A3, and measures 10 x 7

mm in size and 4.5 mm thick. The bone represents a fragment of plastron and is identifiable as *Pseudemys rubriventris* by its thickness and the presence of the typical irregular finely sculpted surface pattern. The redbelly was the second largest turtle available to the local inhabitants, reaching a carapace length of 10 to 12 inches (25-31 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.

The Redbelly Turtle.

The redbelly turtle is currently extremely rare and restricted in New England. It is an interesting species that has a disjunct modern distribution. During the last interglacial period it was probably contiguously distributed all along the emergent continental shelf from North Carolina to New Hampshire. The northeastern 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 by the U.S. Fish and Wildlife Service. 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 us to understand the redbelly's former range and helping us to formulate a conservation policy based on documented former localities.

The former New England distribution of the redbelly turtle was wider than it is now, and it appears to have become locally extirpated at least partially through the predatory pressure of prehistoric man. Several other instances of the occurrence of redbelly turtle material in prehistoric midden deposits in New England have been recorded. Bullen (1949), Waters (1962, 1966), and Rhodin and Largy (1984) have recorded midden finds at Ipswich, Martha's Vineyard, and Concord. The present record extends the former range of the redbelly turtle to Cedar Swamp, Westborough, at the headwaters of the Sudbury River, a range extension of ca. 25 km southwest of the Concord record. It also represents the first record of this species as having formerly occurred in Worcester County, Massachusetts.

An additional fragment of *Pseudemys rubriventris* bone has also recently been found at the Watertown Dairy site on the Sudbury River in Wayland, Massachusetts by Tonya Largy (see Largy 1983, for site description). I have examined and identified the fragment, a surface find of calcined bone of obvious archaeological origin, measuring 9 x 7 mm and 2.5 mm thick. The piece represents a carapace fragment showing a suture line and typical subparallel carapacial rugose striations. The fragment is very slightly concave, probably representing the medial third of the right 8th costal of a subadult animal with the vertebral-pleural suture just lateral to the costiform process.

The finds of redbelly turtle at Cedar Swamp and Watertown Dairy 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. The present and former distribution of the redbelly turtle is illustrated in Figure 1.

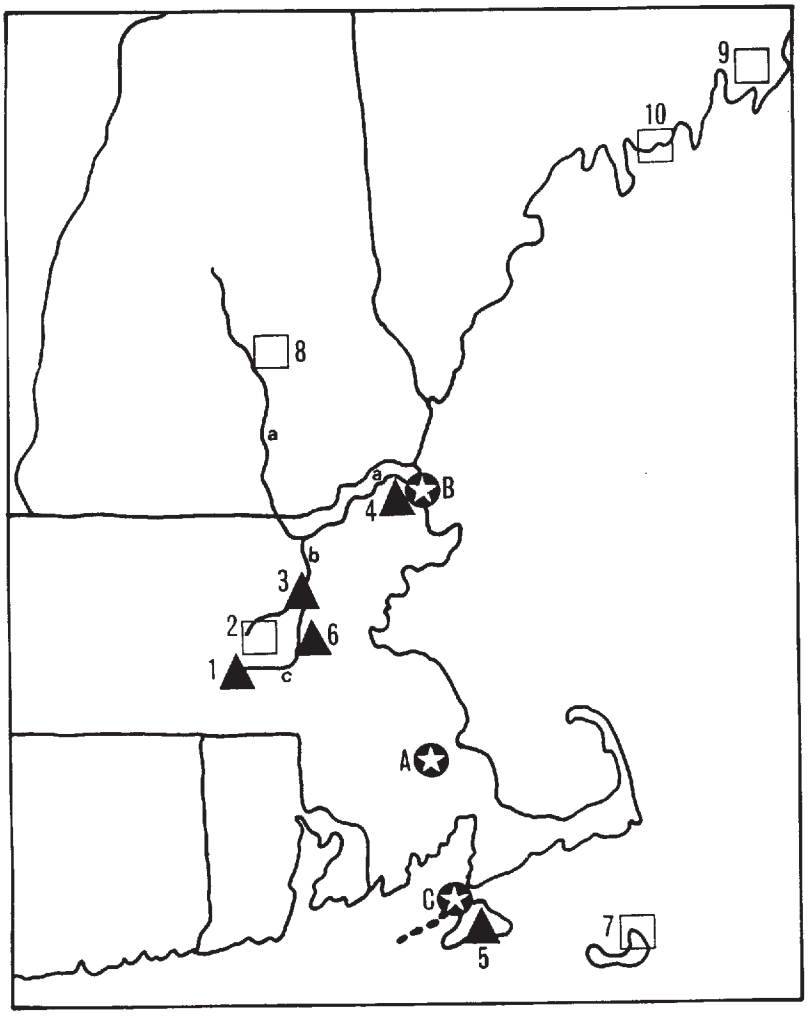

Figure 1. Map showing present and former distribution of the redbelly turtle, *Pseudemys rubriventris*, in eastern New England. Lettered stars represent modern material: A. present known distribution, Plymouth County, Massachusetts; B. single recent find of dead animal, Parker River, no confirmed population known to exist; C. possible small living population, Naushon Island, not confirmed, disputed in the literature. Solid triangles represent archaeological midden redbelly material: 1. Cedar Swamp, Westborough, Massachusetts; 3. Shell Heap, Concord; 4. Ipswich, Merrimack River drainage; 5. Martha's Vineyard; 6. Watertown Dairy, Wayland. Open squares represent prehistoric midden materials with no evidence of redbelly turtle: 2. Flagg Swamp, Marlboro (Huntington and Shaw 1982); 7. Nantucket (Little 1983; Carlson 1990); 8. Sewall's Falls, Concord, New Hampshire (Howe 1988); 9. Olsen site, Cushing, Maine (Downs 1987); 10. Hog Island site, Maine (French 1986). Major rivers of the Merrimack drainage basin are noted on the map: a. Merrimack River, b. Concord River, c. Sudbury River. Further analysis of the chelonian zooarchaeology of sites 1, 2, 3, 8, and 9 is also presented in this paper.

Table II. Chelonian zooarchaeological analysis of five eastern New England prehistoric sites. See text for sources of data and site descriptions. Only Flagg Swamp material not identified by Rhodin. N = number of identified fragments of turtle bone, % = percentage of each species' occurrence in each faunal assemblage as based on number of bone fragments found.

	CEDAR SWAMP		FLAGG SWAMP		CONCORD SHELLHEAP		SEWALL'S FALLS		OLSEN SITE	
SPECIES	N	%	N	%	N	%	N	%	N	%
PAINTED	17	43	10	20	118	38	3	8	12	57
SPOTTED	5	13	36	74	4	1	1	3	2	10
SNAPPER	8	20	0	0	13	4	9	25	0	0
BOX	4	10	1	2	35	12	0	0	0	0
MUSK	4	10	0	0	60	20	1	3	0	0
WOOD	1	2	2	4	6	2	22	61	7	33
REDBELLY	1	2	0	0	66	21	0	0	0	0
BLANDING	0	0	0	0	7	2	0	0	0	0
TOTALS	40	100	49	100	307	100	36	100	21	100

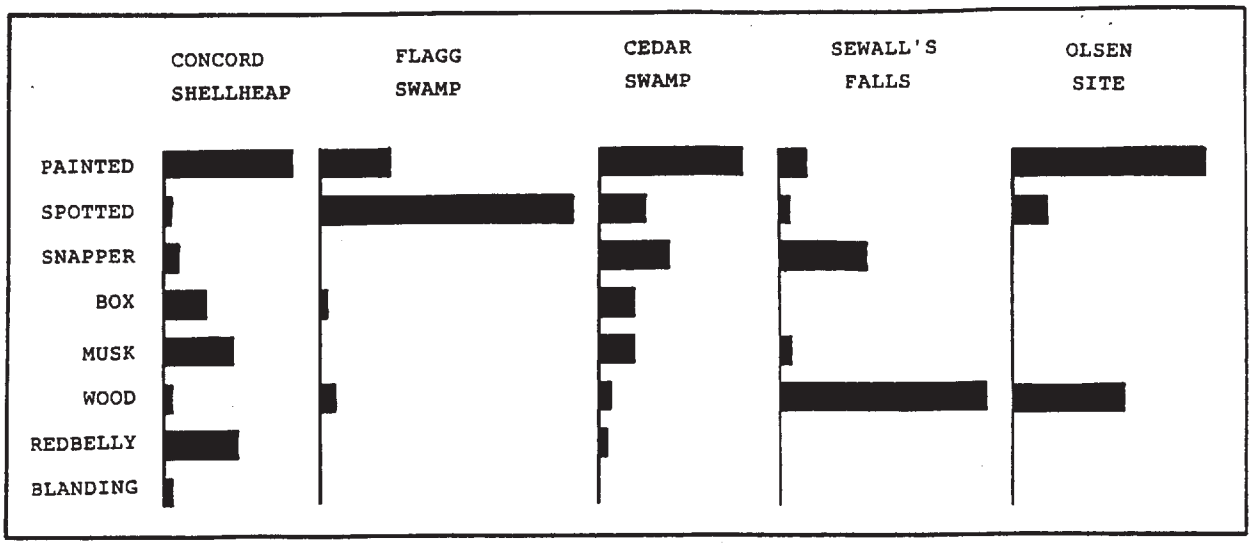

Figure 2. Graphic representation of the chelonian zooarchaeological analysis presented in Table II. Horizontal lengths of solid bars represent the percentage of each species' occurrence in each faunal assemblage, with the total for each site adding up to 100%, and the scale identical for each site.

Chelonian Zooarchaeological Analysis.

A chelonian zooarchaeological analysis of the turtle fauna recorded at Cedar Swamp sites can be performed in conjunction with other eastern New England midden finds. For the purposes of this paper, I compare Cedar Swamp with four other sites where the chelonian material has been sufficient to yield significant results. These sites are recorded on the map in Figure 1 (sites 1, 2, 3, 8, and 9) and the chelonian zooarchaeological analysis in Table 2 and Figure 2. In addition to Cedar Swamp sites, they are: Flagg Swamp Rockshelter, Marlboro, identifications of turtle bone by Huntington and Shaw (1982); Shell Heap, Concord, Massachusetts, identifications by Rhodin and Largy (1984) and Rhodin (1986); Sewall's Falls, Concord, New Hampshire, identifications by Rhodin, preliminary findings published by Howe (1988); and Olsen site, Cushing, Maine, identifications by Rhodin, preliminary findings reported by Downs (1987), site described by Spiess and Eldridge (1985).

Of the four archaeological sites within the Merrimack River drainage basin, three are in the Concord River drainage. One site is from northeastern coastal Maine. The eight species of turtles recorded from these sites 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. One species found at Concord Shell Heap has not yet been recorded from Cedar Swamp: the Blanding's turtle (*Emydoidea blandingii*), which has a markedly limited, disjunct distribution in New England, and has only infrequently been recorded from local prehistoric sites (Rhodin 1986; French 1986).

Of particular note in comparing the five 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 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 38% painted turtles and only 1% spotted. This would suggest 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 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 greater 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. The two spotted turtle plastral fragments found with visible growth zones support the supposition that spotted turtles were being collected at the site during the early spring months. The higher percentage of painted turtles supports 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, suggests 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 not known to occur. 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 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 turtles from Olson site is surprising but may simply reflect the relatively small size of the sample available for analysis.

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 is not unexpected. Box turtles (*Terrapene carolina*) were only common at the two summer or all-year habitation sites within the current range of the species, Concord and Cedar Swamp, 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. Musk turtles (*Sternotherus odoratus*), though foul smelling and very small, were obviously utilized by prehistoric man, being found at three of the five sites. Their use in the diet of prehistoric man has also previously been noted by Adler (1968). The redbelly

turtle (*Pseudemys rubriventris*), as discussed above, was found at three sites where living populations no longer occur. The evidence suggests at least partial extirpation at the hand of prehistoric man. A similar pattern of human-induced local prehistoric extinction has been documented for box turtles in northern New York state (Adler, 1970).

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

LITERATURE CITED

Adler, Kraig K.

1968 Turtles from archeological sites in the Great Lakes region. Michigan Archeologist 14:147-163.

1970 The influence of prehistoric man on the distribution of the box turtle. Annals of the Carnegie Museum 41:263-280.

Bullen, R. P.

1949 Excavations in northeastern Massachusetts. Papers of the Peabody Foundation 1(3):129-132.

Carlson, Catherine C.

1990 Seasonality of fish remains from Locus Q-6 of the Quidnet site, Nantucket Island, Massachusetts. Bulletin of the Massachusetts Archaeological Society 51(1):2-14.

Downs, Elinor F.

1987 Observations of the Graf collection of faunal remains from the Olsen Site, Cushing, Maine. Private Distribution:1-5.

French, Thomas W.

1986 Archaelogical evidence of *Emydoidea blandingii* in Maine. Herpetological Review 17(2):40.

Hoffman, Curtiss

1988 Radiocarbon dates from Massachusetts. Bulletin of the Massachusetts Archaeological Society 49:21-38.

Howe, Dennis E.

1988 The Beaver Meadow Brook site: prehistory on the west bank at Sewell's Falls, Concord, New Hampshire. New Hampshire Archeology 29:48-107.

Huntington, Frederick W.

1982 Preliminary report on the excavation of Flagg Swamp Rockshelter. Institute for Conservation Archaeology, Publ. 214, Cambridge, Mass.

Huntington, Frederick W. and Leslie C. Shaw

1982 Turtle remains. In: Preliminary report on the excavation of Flagg Swamp Rockshelter. Huntington, F. W., ed., pp. 113-117. Institute for Conservation Archaeology, Publ. 214, Cambridge, Mass.

Largy, Tonya

1983 A controlled study at the Watertown Dairy site. Man in the Northeast 25:95-107.

Little, Elizabeth A.

1983 Locus Q-6, Site M52/65, Quidnet, Nantucket, Massachusetts. Nantucket Archaeological Studies 2. Nantucket Historical Association.

Rhodin, Anders G. J. and Tonya Largy

1984 Prehistoric occurrence of the redbelly turtle (*Pseudemys rubriventris*) at Concord, Middlesex County, Massachusetts. Herpetological Review 15(4):107.

Rhodin, Anders G. J.

1986 Analysis of prehistoric turtle bone remains from Cedar Swamp, Westborough, Worcester County, Massachusetts. Archaeological Quarterly of the W. Elmer Ekblaw Chapter, Massachusetts Archaeological Society 8(2):2-9.

Spiess, Arthur E. and Stuart Eldridge

1985 Cushing/St. George archaeological survey, 1985. Report on file with the Maine Historic Preservation Commission, Augusta.

U.S. Fish and Wildlife Service.

1985 Revised Plymouth red-bellied turtle recovery plan. U.S. Fish and Wildlife Service, Newton Corner, MA.

Warfield, Ruth

1986 Cedar Swamp-3: a preliminary report on the features. Archaeological Quarterly of the W. Elmer Ekblaw Chapter, Massachusetts Archaeological Society 8(1):1-50.

Waters, Joseph H.

1962 Former distribution of the red-bellied turtle in the Northeast. Copeia 1962(3):649-651.

1966 Second find of red-bellied turtle on Martha's Vineyard Island, Massachusetts. Copeia 1966(3):592.